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The Superintendent, the Conductor and the Engineman.

This was the title of an article, by one of the editors, which was published in the *Railroad Gazette* of July 18.\* The substance of the article was an inquiry into the causes of butting collisions, the classification and definition of the causes being taken from the Interstate Commerce Commission's Quarterly Accident Bulletin No. 2, in which was given a record of 27 disastrous butting collisions costing over \$300,000. It was suggested that a study of the reports of accidents had shown that many of the derelictions from duty were the result of habitual neglect of well-known rules, and it was argued that a more thorough inspection by the trainmaster and his assistants would detect and correct much of this habitual negligence.

A number of letters have been received commenting upon and criticising the statements of fact and opinion in this article. These letters are too numerous and too long to be printed in full, and we shall therefore undertake to summarize their essential points, taking first those which are adverse and afterward those in which the writers of the letters agree with the original article.

The first objector complains that the comparison of American railroad methods with those of England is unfair because of the difference in conditions as between the respective countries. This objection was considered in an editorial published September 5 (page 690), calling attention to instances where American railroads had succeeded in making good records in spite of the obstacles and hindrances said to be peculiar to American railroad service. It is but fair to mention, in this connection, that the comparison with England was not offered as an essential or even an important feature of the case against the American superintendent. The English roads made a great record in 1901; a record, potentially, of the prevention of all kinds of accidents; but it is only one class of accidents, butting collisions, that could be compared with American railroad management as discussed in this article. The standard aimed at on American railroads is, of course, perfection; and the American superintendent will, of course, strive to attain it, even if he pays no attention at all to what may be done in England or elsewhere. The English record was mentioned merely as a reminder that there was nothing unreasonable in demanding a higher degree of safety in American railroad travel. The present excellent state of discipline in England—discipline is admittedly a vital factor in the prevention of collisions—may or may not have been attained without such inspection as Mr. Adams recommended; but the point is that inspection will reveal whether discipline does or does not need to be improved; and, in the general lack of definite information as to this fact, a demand for inspection must be the first move of the inquirer or critic. Speaking of American railroads generally, there is no ground for asserting that discipline is adequate; and there is no ground for positively asserting the contrary; an academic defense may be put up for the assertion that all the collisions are due to incurable "human nature"; therefore the least that can be said is that there is a fault somewhere and that inspection ought to show where it is.

The second criticism, and the one which appears to arise most frequently in the American superintendent's mind, is that accidents result mostly from mistakes made

by well-trained and experienced men. One general manager says, "Men differ widely in their inherited capacity and also as a result of their surroundings and conditions of training. All men cannot be trained by any ordinary method of education or surveillance to render equally careful and intelligent service. Those who have long records in the service free from accidents and with reputations as careful and intelligent men, are at times affected, and probably temporarily unfitted, due to illness in their families, their own concealed illness, or other like causes, to render their usually efficient service. On the other hand, men of mediocre and at times indifferent ability, under ordinary conditions, may rise to the demands of an emergency of which others of more promise are incapable. Men offer themselves for service at times in apparent good condition, when they are not physically and mentally fit for the service expected of them." A general superintendent in the Central States says: "There have come under my observation, and no doubt that of other operating officials, many cases of disobedience of rules under circumstances which can only be explained by the theory that the individual was afflicted with temporary aberration of mind; and this occurs not with men of inexperience, or wanting in intelligence, but often with men occupying the highest positions in train service, with admirable record and of long experience."

One manager argues that a comparison with the discipline of sleeping car employees is unfair because of the difference in the kind of work as compared with the duties of enginemen, signalmen, etc., and of conductors in train running as distinguished from dealing with passengers. To this point Mr. Adams, while, of course, recognizing the facts, would answer that the sleeping car service was cited merely as an example of a case where a considerable amount of money and a considerable number of men are employed for inspection alone. The kind of work or kind of inspection does not materially affect the main argument.

A Chicago vice-president objects to the assumption "that the cost is the only reason for the non-adoption of secret inspection of train service. If the inspection suggested would guarantee immunity from accidents its adoption would be prompt and general." To the reader of the article the answer to this is obvious. If inspection is useful, every sagacious manager desires to employ it. The fact that it has been proved useful on some roads affords presumptive evidence that it would be useful on others; and as the managers of these other roads are sagacious in other matters the only imaginable reason why they do not exercise sagacity in this one is that they cannot; that poverty, real or supposed, restrains them. No one claims, of course, that inspection will guarantee immunity; but it might perhaps be made to guarantee peace of mind to the superintendent.

An eastern superintendent says that his road foremen of engines do watch vigilantly for errors committed by trainmen; to say that they give their chief attention to the locomotive, and for that reason are not efficient as regards other work, is not correct.

Most of the letters expressing views which agree with those of Mr. Adams contain both the opinions of the writers and information as to the practice on the writers' roads, and some of the information given is marked "not for publication." Quoting only from chief officers of large roads, the following extracts may be given:

"The article contains a most excellent suggestion and is especially valuable at the present time." An officer of a trans-continental road says: "You have struck a great weakness in our methods of railroading. I want to send a copy of your article to each of our superintendents." A western general manager says: "Your article is right to the point, and I believe it will be the means of awakening a great many. Eternal vigilance is certainly the price of safe service. You may have bushels of rules, but it is the application of a few regulations that save life and property." Referring to the specific topic discussed, a general superintendent says: "To gain the best results, there should be sufficient supervision to permit the covering of the territory with reasonable frequency, and there should be sufficient contact with the rank and file to permit close study of the character and moral make-up not only on duty, but off duty as well. The important time to supervise the conduct of men is when they are off duty."

A manager says: "Strict surveillance is the key to safety in railroad operation. In order to intelligently check train work and at the same time do the men no injustice, which has many dangerous results, the inspector so employed must be of equal skill at least, to those engaged in such service. . . . The work of employees connected with train service should be watched at all times by superintendents while on the line; but this sort of inspection cannot be considered wholly effective, for the reason that when employees in such service are aware of the presence of officials they exercise more than usual care. . . . This, however, is not true of the conscientious employee. Few employees in train service are wilfully negligent of their plain duty; but probably 90 per cent. of their violations result in favor of the employee, which causes them to become less vigilant and alert, while if they knew they were being subject to observation at any time, without their knowledge, they would be more particular. . . . Some system of inspection or check in keeping employees spurred up to a higher standard of efficiency, would very materially lessen the number of collisions and other train accidents."

A western president says: "I believe in your idea thoroughly."

Practice of Various Roads.

On the New York, Chicago & St. Louis, trainmen are called in at random, and their knowledge of rules tested by requiring written answers to a few test questions, varying the questions with each individual. Conductors' reports of incidents and delays are carefully scrutinized. On an important eastern road a censor of train orders has been appointed. Enginemen are carefully watched to see that they fully observe signals.

An eastern superintendent reports that he has no secret inspection, except in cases where there has been reason to believe that men's habits off duty were not satisfactory. Two roads in the West report that they do have secret inspection, but it is not so extensive as is outlined in the article. A general superintendent until lately in charge of a road in the West, reports that in eight years, on a road having 350 miles of main line, with many special train movements, there was but one butting collision, and that was due to the failure of an operator to deliver an order. This good result is attributed to having trainmen of good character and fair intelligence, who had been carefully examined on the rules.

On the Chicago & Alton an employment bureau has lately been established. This was noticed in the *Railroad Gazette* of Aug. 15, p. 642. On the same road there is an examining instructor who uses a stereopticon, with which he shows signals and other features of actual work. On this road "superintendents, trainmasters and road foremen of engines are required to constantly check up the men. The trainmaster and road foremen of engines are not allowed to do any office work. Their duties require them to be on the line all the time. In addition to this reports are made by signalmen, who have charge of block signals, of all cases of failure to observe the signals. These men are on the line constantly. The superintendent also requires reports from the trackmen. The work in this line is being enlarged from day to day, and the inspection is being made more rigid."

The Illinois Central has in its employ 1,052 conductors and 1,280 enginemen, on 4,284 miles of road, of which 450 miles are double-track. There are 12 superintendents, 25 trainmasters, 16 chief train dispatchers, 1 inspector, 11 master mechanics and 10 traveling engineers supervising these forces. "It is the established policy to increase the supervision as the need for doing so becomes apparent. It is expected that these supervising officers will, and they do, keep in close touch with the men, become acquainted with their character and habits, take up infractions of the rules, whether resulting in accidents or not, and keep a record of each man's conduct under the Brown system of discipline. A board consisting of the superintendent, trainmaster and master mechanic of each division periodically reviews the records of the men and from such records, together with their personal knowledge of the men, determine whether or not they shall be continued in the service."

Following are two articles from well-qualified observers who not only are intimately acquainted with details, but have the active responsibility which compels them to take practical views. Mr. Love has had long experience as a trainmaster and in kindred work. Mr. Davis draws a pretty strong picture; but it is not to be denied that many of his lines represent real life; represent the results of a volunteer inspection which, if accompanied by names and dates, would, no doubt, explain a good deal of misconduct which the regular records do not explain.

DIFFICULTY OF TRAINING MEN OVER 25; THE TRAINMASTER'S LONELY POSITION.

By A. J. Love.

The article of July 18 on "The Superintendent, the Conductor and the Engineman," asks for "further and more thorough study of the causes of collisions"; and goes on to give the value of inspection; and it questions the thoroughness of inspection as now usually carried out.

Inspection will not accomplish all that is necessary, but will demonstrate what is necessary. There must be education, training and inspection. The inspection of the train service, the education and the training of the men may not be what it should be on all roads, but there are exceptions. The author apparently overestimates the force needed. Deterioration of the discipline of the force cannot occur without notice, if all the officials concerned are watchful. The dispatchers and the chief dispatcher, working with the trainmaster, can keep so thoroughly in touch with the situation that a large force of inspectors is not generally needed.

The necessity for systematic and thorough inspection always exists. To take the process in order, there should be verbal education, thorough training and thorough inspection. The verbal education—that is, the knowledge of the rules—is only the first step. That this is essential can be illustrated from the fact that in one case a superintendent entirely disagreed with his trainmaster and chief dispatcher on an important rule, although the rule had been in force for years before the question came up. This was brought up in a class, where the officials were present, and the disputed point was settled. These educating classes not only give the men the knowledge of the rules, but, if properly conducted, quicken their perception and qualify them to instantly decide what course to pursue in emergencies.

The next point is their training; that is, the direc-

\*A few copies of that article reprinted in pamphlet form may be had from this office at 10 cents each, or 25 for \$2.



tion of their work on the ground; the enforcement of the observance of every detail of the rules promptly and quickly. If the young men entering the service have the advantage of this education and training, by competent men, there is little to fear; but both must be thorough. It is hard to train the ordinary man after he passes 25, but there are some exceptions. Usually, the results are poor. The "experienced" man that has not been trained, or has been incorrectly trained, is worse than the young man with no experience.

Bad habits once fixed are almost impossible to eradicate. Inspection is necessary to keep the force up to the work; but the most rigid inspection cannot accomplish all that is necessary to prevent collisions. The inspection locates the habitual delinquent; but this is only the beginning. The attention of the delinquent may be called to his error, or he may be punished by suspension. Close and continued inspection will often demonstrate that the man will repeat the fault. You know he is earnest, faithful, diligent and loyal, but from poor or insufficient training, or some constitutional defect, he continues to commit the same errors. Inspection develops this, and he must be taken out of the train service. These cases are sometimes pitiful, but the fault can no more be corrected, in such men, than can color blindness.

It seems that some men are liable to continue making the same mistakes, from causes we cannot control. These we can correct only by removing the men. There are other occasional oversights and errors from other causes, that are practically beyond control under our present system. As an illustration: The meeting point for two trains had been made by train order regularly for months at A. One day there was a variation, and the order was given for the two trains to meet at B. The operator transcribed the order correctly, but read it A to the trainmen (it was the custom on that line for the operator to read the order to the trainmen). The trainmen read the order, but passed B (where the opposing train was on the siding) and went to A and asked for the whereabouts of the train they met at B. Objection may be made to the manner of handling the orders in this case; but the fact remains that a previous fixed habit was sufficient to eradicate any impression made by the order. The men realized instantly that the order was to meet at B, even without referring to it, when the operator said the train went to B.

In another case an engineer pulled by the meeting point some distance before he could be stopped. He was dismissed. Little was known of his private affairs, as he was a very reserved man, but it afterwards developed that he had just sent his wife to an asylum, as hopelessly insane; and it is probable that his preoccupation with his private affairs caused the blunder. Many cases of a similar character could be cited. In a recently published article about the working of the brain, a case is cited of a young man who exercised violently for some time in a gymnasium, and was shortly afterwards given some questions to answer; he could not remember the most familiar names, and was so affected that he burst into tears.

Some writers on the function of the brain say that if certain actions are repeated for a long time they strengthen the communication between the perceptive and the motor nerves until there is no effort of the will necessary; that the communication is direct, and is what we call "mechanical." If this be true (and it seems probable), then the advantage of working railroads by signals alone, as compared with our present system, is apparent. A well-drilled man will act in accordance with the signals, without any effort of the will whatever, and can do his work correctly in a much lower physical condition than where an exercise of the will is necessary. The necessity for drill is still the same, but it brings higher results. In this connection, it is much easier to drill a young man than an old one who has not been accustomed to signals. The old man has not the habit of watchfulness for signals that you can drill into the young man.

The Trainmaster has few precedents; and he has no "association" where he can compare his experience with, and profit by, that of others. Consequently he is often poorly qualified for his place. Do not, however, blame him too severely; the fault is largely elsewhere. Army officers have assistance in these matters. Even kindergarten teachers have thorough and scientific guides in their drills; but the Trainmaster, as far as his special line is concerned, must work out his own salvation. Perfection in this line can only come from years of well-directed labor. In the process of training, the conductor is a large factor. When the conductor is made to realize that he must assist to drill every man under him, it simplifies the situation.

#### RAILROAD MEN WHO LIVE IN GLASS HOUSES.

By David Davis.

The article in the *Railroad Gazette* of July 18 last by B. B. Adams on the "Superintendent, the Conductor and the Engineer" is a thorough and systematic statement of facts, with some valuable suggestions. It contains much food for reflection. I venture some notes based on observations in actual life.

The first fact is that now everywhere we are handling an enormous business. Facilities of road, power and terminals are not adequate, and we take chances. We run trains in sections, we make close meets, we encroach on the minimum allowable time, we overlook a strict compliance of rules to avoid delay. We chain-gang our locomotives, we double our crews, we hire a large number

of new men, and every one is spurred on to the limit of his capabilities; so if mistakes happen, orders are forgotten, speed is increased beyond the limit of safety, whose fault is it? Most railroad men are like the man in the glass house; they dare not throw a stone.

It is an every-day occurrence for the subordinate official to listen to engineers, telling of methods and means used, chances taken, and fast time made, not strictly in accordance with the rules. The engineer knows that his conduct will be overlooked; not only overlooked, he will probably be held up as an example; he always makes time. But he does this by disregarding slow flags, slow bulletins, 10-mile orders over doubtful bridges, and through city limits, and so on. If calamity follows, who is to blame? According to the report of the investigation it is the engineer; but is he morally responsible? The despatcher knows the truth, and commands disregard of his own orders. The Superintendent knows the facts and does not protest, except in case of accident; and the General Manager commends the Superintendent who hauls the longest trains, makes the best time, and handles the largest volume of business, without serious accident.

One possible solution of the single-track superintendent's greatest difficulty would be to make 5, 10 or 15-mile stretches of double-track and arrange to have all meets on these stretches. This suggestion is particularly intended to apply to western roads, where land is of little value, and the country is level. In many cases a little expense would connect two or three 1-mile side tracks into a 10 mile stretch of double-track. Next to double-tracking is the personal equation. The personnel is not always what it might be; and who is to blame? We frequently find one department imposing on another; asking to have men employed who are not fit for the place. The claim department sometimes settles a claim by giving a man a job. They settle with the widow of a brakeman who lost his life in the performance of duty, promising to her for each of her 7 sons that they shall all be made engineers or conductors, and orders are given for their employment. It doesn't matter to the agent of the claim department; he has made a favorable money settlement and is considered by his superior highly efficient. The land department sells a piece of land and furnishes employment to 4 doubtful sons of the purchaser to make the payments. The political end of the institution also furnishes employment to its followers and friends. There is too much sentiment. Men are retained in service on account of acquaintanceship, family distresses, and an undue regard for good records in the distant past.

The importunities of the wife, mother or sister, of a moral degenerate often have an influence. Some employing officers will hire a man who is persistent, to get rid of him. Others will hire the first man who comes along when a man is wanted rather than suffer a slight inconvenience, in waiting for a better one to appear; or promote too soon a man who properly fills a minor position because there is no available person competent for the high place, or because the man's friends put up a strong talk for him. Men are hired because their application was filed, and they are retained because they were hired; and they plod along in an indifferent way always having in them the possibilities of failure at a critical time. Mistakes made by these men do not come to light because of the fact that the child's safeguard still exists: "If you tell on me I'll tell on you." Thus such employees slide along until calamity overtakes them and there is a good excuse for their dismissal.

It is not uncommon when a man of this kind is brought up to be examined for a conductorship or engineership, to hear the examiner remark that the man was pretty dull, that he would probably never be a first-class engineer or conductor; that such a man should never have been hired, but that it would be too bad to turn him down because he had served a long and hard term with the expectation of promotion. So they scratch through. The examiner will even predict that such men won't last long in the new position, that they will neglect some rule and be dismissed. He forgets that they may cause a \$50,000 wreck or loss of life.

As to train orders, is not the cause of oversight oftener due to a multiplicity of orders, confusing the crews? For instance, a train of the first-class gets behind time several hours, and continues to lose or make up time and four, five or six orders, giving time over the belated train, are issued, thus rendering possible the reading of the wrong orders. Would it not be better to lose more time with one train, take away its rights and run it extra, than to delay numerous other trains and render possible a confusion or misinterpretation of orders? Is it not a fact that most or many serious accidents are due to belated trains, and rarely to those on time?

If it were a dischargeable offense for an employee to know and not report infractions of rules, and the "surprise system of checking" were employed, good effects would undoubtedly be produced. It is a well-known fact that employees do not report serious infractions of rules by their fellows; the reverse is true. In most cases the man will perjure himself to shield a fellow whose carelessness has nearly cost him his (the perjurer's) life; and then he takes another chance, the next day.

The so-called humane "Brown System" is of doubtful worth. It does not weed out the undesirable characters who have shown by many minor infractions of rules that they are liable to overlook an important order. Their "record" suspension is of no value in teaching them greater care. Where 60 or 90 demerits mean dismissal we find the official's better judgment tempered by pity

or sentiment and instead of giving the last 10 days which will cause dismissal we find him giving 8 or 9 days of the last 10. This does not apply to all men, nor do all officials act so weakly; but such cases are numerous.

#### Blest Be the Tie That Does Not Bind.

Only Y. M. C. A. members will understand this title; but the picture will be comprehensible to all. The engraving shows how a chestnut tie 8 ft. x 7 in. x 11 in. recently had two transverse strips of its surface polished as brightly as ever was seen in the good old days of wooden brake-shoes, when billets of wood rubbed to a remarkable smoothness were a familiar sight. This tie, in the position shown, was pushed by the tender wheels  $5\frac{1}{2}$  miles, and was finally taken off before it caused any damage. The incident occurred in the evening about 8 o'clock. When approaching a station and running about 30 miles an hour the engineer heard an unusual noise, but could discover nothing wrong and thought no more of it. At the station the usual stop was made and nothing wrong noticed. At the next station (a junction) the train crossed three tracks and made a station stop. Leaving the station the train started hard but freed itself quickly, and the engineer thought the trouble was caused by the brake sticking. The train then ran four miles at about 40 miles an hour and passed three double slip cross-overs. Leaving the next station the train again started hard; and after running about 500 ft. a stop was made, when the tie was found, resting on both rails in front of the tender wheels, as shown in the engraving.

The sleeper appears to have been maliciously placed on the track, another one having been encountered by another train soon afterwards and pushed about half a mile. The sleeper was one which had been rejected by the company and had lain at the side of the road several years, but it was of sound chestnut, though a little soft on the surface. It was almost exactly centered on the



track, the difference in the length of the projecting ends at either side being less than one inch. The wheels which bedded themselves in the sleeper appear to have slid nearly or quite all of the way. There are no plank crossings on the line which was traversed. The other sleeper referred to, which was dislodged after being pushed half a mile, was eventually stopped by a foot walk, the planks of which were torn up.

The date of this occurrence was Oct. 6. For location, and the name of the railroad company, the reader must study the scenery in the cut, and the characteristics of the tender.

#### Notes From Japan.

The Sanuki Railway Company has lately engaged eight girls as waitresses for their passenger trains, and intends to employ women in the ticket service as well. That railroad is bound, although in a remote part of Japan, to be patronized by foreign tourists.

Tokyo will be provided in a year or two with good electric street railroads. Money is still wanted by the company but a determined attempt will be made to get capital from England, and an Englishman here has, at the instance of the company, drawn up an attractive prospectus for circulation in Great Britain.

Tenders were lately invited by the company for the supply of a large quantity of plant, and Messrs. Frazer & Co., of Yokohama, were successful in the matter of supplying carriages and accessories at a cost of yen 288,000, the highest offer being yen 650,250. For the supply of rails, the China and Japan Trading Company secured the contract at yen 195,664; the highest price tendered being yen 247,574.

There seem to be good prospects before this Street Railroad Company, but it is to be feared that the distrust of the Japanese where foreign capital is concerned may delay the scheme.



### Improvements on the Lackawanna Since 1899.

When the change in management of the Delaware, Lackawanna & Western took place, in the spring of 1899, the incoming officers found a road which extended from the seaboard to the Great Lakes, through New Jersey, the mountainous regions of Pennsylvania and the undulating area of southern and western New York, with branches into the slate and cement regions of Pennsylvania and New Jersey, the Lackawanna and Wyoming anthracite

and desirable to do as much work as possible by company forces, rather than by contract, and warranted the expenditure the company has made in providing an efficient plant for this purpose. In order to handle the bridge and building and the masonry work to the best advantage, the system was divided in March, 1901, into three divisions, with a Superintendent of Bridges and Buildings on each division. The first of these is the Morris & Essex, which operates in the suburban and industrial territory of New Jersey and has grades generally not over 45 ft. per mile.

under railroad embankments. One hundred and forty of the steel railroad bridges (including eight new draw bridges), and 123 of the other class (including one new highway draw bridge) have been completed. The total length of steel railroad bridges which have been ordered is equivalent to 3.62 miles of double track, of which 2½ miles have been completed. In this connection it may be stated that no derailments or injuries of any kind to the traveling public have been caused on account of the rebuilding work on bridges and masonry. The cost of this



Erecting the Bridge Over the Passaic River, West of Paterson.



The New Bridge Over the Passaic River, West of Paterson.

fields, and the agricultural, dairy and industrial area of Central New York. The ruling grades and curves were severe, but so located (as in the approaches to Scranton, the Mt. Pocono and Mt. Morris summits, etc.), that it was not feasible to change them radically and the policy of former managements had been to handle traffic in short trains with small cars and correspondingly small locomotives.

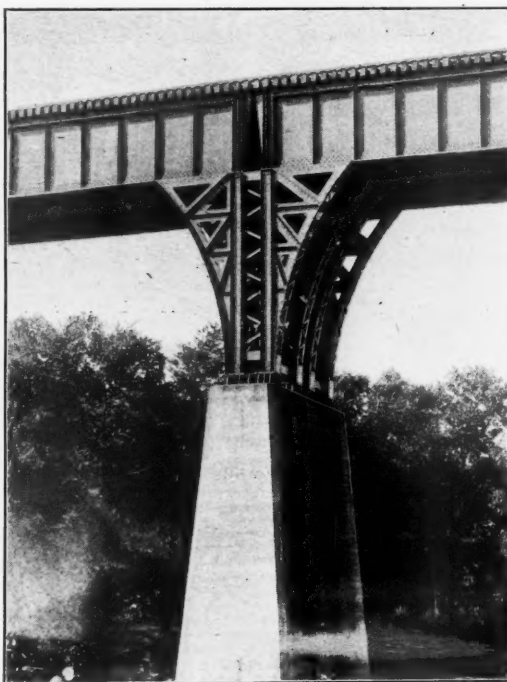
The track was in fair condition, but the line was equipped, in many places, with bridges too light for heavy motive power, and in such shape that it was usually necessary to replace substructure as well as superstructure. The water supply was badly located and inadequate; roundhouses, passing sidings and terminal yards were too small to serve a road worked with modern equipment; in short, there was need of general renovation.

Starting at once with heavier motive power on those portions of the line where the bridges could stand it, the use of large locomotives was extended as fast as the bridges and other structures could be made ready for them, until the average train length had been greatly increased, and running time was very much reduced. President Truesdale, in his first annual report, in 1899, said that the problem which the company had to consider and solve was that of "decreasing its transportation cost by the use of heavier locomotives and cars, and the adoption of modern methods and improved devices for maintaining its property," and it has been necessary to make practically all the progress achieved along these lines, without the usual possibilities of bettering grade and curvature. The policy of the management furthermore required that these changes be made as earnings afforded, so that unusual effort has been required in the engineering, mechanical and operating departments, but it is safe to say that in the great wave of activity in betterment work which has passed over the railroads of the country during the last two or three years, few roads have been more progressive than the Lackawanna. The changes also include the installation of block signals, interlocking plants, new passenger stations, and a large variety of other betterments which will be taken up more in detail later on.

#### BRIDGES AND MASONRY.

The large amount of work to be done in rebuilding bridges and masonry, and the maintenance and safety of traffic during this reconstruction, made it both economical

The second division, known as the Scranton Division, is in the mountainous and coal regions of Pennsylvania, with grades from 50 to 78 ft. per mile for lengths of 18 miles. The third, or Buffalo Division, is in the long plain of southern New York, with working grades of 20 ft. per



Bridge Over Passaic River West of Paterson. Arched Legs Supporting Ends of 100 ft. Plate Girder Over Center Pier.

mile, with a maximum of 60 ft. for one stretch of eight miles.

The company employed its own inspectors to do all of the inspection of steel bridge work at the shops, as well as a part of the mill inspection; and four bridge erecting crews were equipped and are now doing all the erection of steel bridge work. Each of the three divisions is provided with a 50-ton capacity steam wrecking derrick, of the type illustrated, and in addition each Superintendent of Bridges and Buildings has a 20-ton steam derrick car for light and quick work. All of these machines, together with other equipment, are used in the erection of bridge work, removing old masonry, etc.

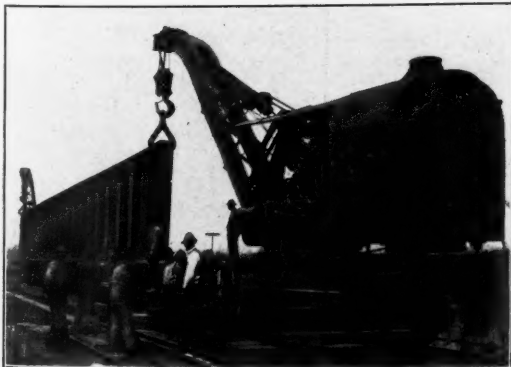
During the past three years the company has contracted for 31,923 tons of steel work for bridges and 1,367 tons of steel work for buildings, making a total of 33,470 tons. Twenty-two thousand nine hundred and sixty-eight tons of the steel bridge work have been erected, of which 13,985 tons have been erected by contract, and 8,983 tons have been erected by the railroad company. During this time 342 bridges of various kinds have been ordered, and 263 of them have been completed. Of this total number, 189 are steel railroad bridges, and 153 are highway bridges and concrete arches and concrete box culverts

bridge work erected, including masonry substructures, pile foundations, new timber floors and the removal of old bridges, will exceed \$3,300,000.

Several large and notable pieces of bridge work have been completed, among which may be included the new double track through riveted truss bridge over the Susquehanna River near Binghamton, N. Y., which consists of six 160 ft. spans on new masonry. Two thousand six hundred and twelve tons of steel work was used on this bridge, of which a photograph is shown.

East of Elmira, N. Y., a new double-track bridge over the Erie Railroad and Parshall's Cove has been completed, and contains 1,786 tons of steel work. This structure consists of one through and three riveted truss spans with ballasted floor, and has a total length of 625 ft., and is on a skew of 30 deg. The end posts of the through and deck spans are plumb, the portal for the through span being 64 ft. long.

Over the Passaic River west of Paterson, N. J., a new double-track bridge and viaduct has been completed, which is 643 ft. long and 80 ft. high above the river, and contains 1,149 tons of new steel work. The old structure consisted of one 83 ft. lattice truss span, one 200 ft. deck pin span over the river, and six 60 ft. trestle spans of riveted lattice type supported by plumb tower posts. The new bridge consists of three 30 ft. spans, two 66 ft. spans and two 70 ft. trestle work spans, two 100 ft. spans over the river with arched legs, and one 81 ft. span. All of the new spans are deck plate girders. It was designed so that nearly all of the masonry and all of the steel towers for the trestle work were completed without in any way interfering with traffic. The old 200 ft. river span was replaced with two 100 ft. plate girder spans with steel arched legs supporting the ends of girders, the arched legs being supported by new center pier in the river. The 100 ft. girders were proportioned on the assumption that their end supports were 100 ft. center to center. The top of the new river pier is 34 ft. 8 in. below base of rail, and was carried to such height as would clear the bottom chord of the old 200 ft. deck span. When the old bridge was removed the distance from base of rail to the top of new pier was made up by the depth of the new 100 ft. plate girder and arched leg forming its support. In the dismantling of the old bridge and the erection of



Lifting a 105-ft. 6-in. Girder With Two 50-Ton Wrecking Derricks.



Deck Spans, Bridge 30, Buffalo Division.

the new structure no false work whatever was used, with the exception of false work for taking the dead load only of the 200 ft. river span when it was taken down. In other words, the old bridge was utilized for traffic as well as false work for the erection of the new bridge, and the new bridge used as false work from which the old structure was taken down, and at no time was traffic carried on any false work. The old bridge throughout consisted of three lines of deck trusses, spaced 11 ft. centers, carrying double-track, and the new bridge consisted of four lines of girders carrying double-track, and spaced so as to clear the trusses of the old bridge. The erection was done by the company, and traffic was handled on single track while the steel deck above the new towers was being erected.

At the Passaic River crossing near Lyndhurst, N. J., an entire new double-track deck plate girder bridge has been built, which consists of one 61 ft. 6 in. span, two 105 ft. 6 in. spans, and one 158 ft. 10 in. plate girder draw span. The new draw bridge consists of two plate girders, and has two lines of stringers with floor beams, and is a center bearing bridge. The girders are spaced 19 ft. 6 in. center to center, and each girder with one line of stringers carries a track. The old draw bridge was a three-truss through riveted bridge, with trusses spaced 15 ft. centers. The work of renewing the entire crossing, including the taking down of the old draw bridge and the old fixed spans, as well as the erection of the new fixed spans and new draw bridge, was accomplished without

approaches. The new structure consists of four 124 ft. 6 in. fixed spans and one 236 ft. draw span. The depth of water at this crossing is 52 ft., and from base of rail to rock foundation it is 117 ft. The bed of the river is covered with about 20 ft. of silt deposit, and between the

sufficient stability, it was decided not to erect the new draw bridge on false work forming an extension of the old protection pier and roll it into place on trucks at the same time the old bridge was rolled out. Instead of this plan the new draw bridge was erected on false work along the shore of the river, and when the time came for making the move, the old draw was lifted from its bearings onto four scows by removing water ballast from them with centrifugal pumps, and the old bridge was floated out of the way along the shore. The new bridge was lifted from its false work on four scows in a similar manner and landed on the pivot pier. The weight of the draw bridge is 603 tons. The total weight of the bridge, including the false work trusses between the decks of the scows and the under side of bridge, was 743 tons. The time required to move the old bridge out and replace it with the new draw span, and move both of the 201 ft. 3 in. fixed spans endwise 18 in. ready for traffic was 10½ hours. The old draw bridge was landed on the false work on which the new draw had been erected and was there taken apart.

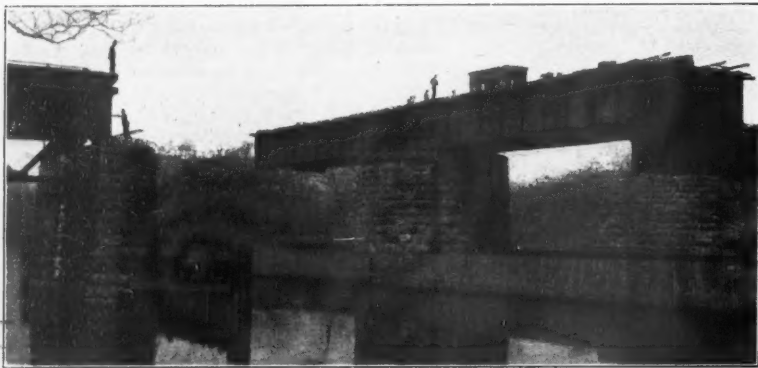
The suburban line of the road also crosses the Passaic River at Newark, N. J., at which crossing a new double-deck riveted 221 ft. draw bridge was completed in April, 1901. The old draw bridge at this point was not of sufficient strength for traffic, and the new bridge was designed as a double-deck structure so that it could be used in connection with the Newark track elevation, which was to come later. The conditions for the erection of this



New Lower Hackensack Bridge, Double Track, Through Riveted Truss.

On Scows in Midstream Ready to be Loaded on Center Pier.

rock and silt deposit there is a bed of good clay. In the construction of the foundations the open caisson process was adopted. Piles 90 ft. long were driven for the center pier, and 85 ft. piles were used for the rest piers of the draw span. The piles for the pivot pier and two rest piers of draw span were cut off 31½ ft. below low tide. Riprap was placed around the outside of the piling, and the space between the piles was filled with gravel. The



New 158-ft. 10-in. Double Track Plate Girder Draw Span Over Passaic River at Lyndhurst, N. J.

any false work whatever. Both the old and new structures were utilized as false work and for carrying traffic during this reconstruction. The only time during the year in which it is permitted to block navigation at this crossing is from Feb. 1 to Feb. 20.

At the Upper Hackensack crossing, near Secaucus, N. J., a new double-track, through riveted truss bridge has been built on a new location. The old bridge consisted of a 176 ft. 2 in. riveted truss draw span, with pile trestle

riprap and gravel were carried up to within two feet of the cut-off of piles before the pile stays were removed, and before the piling was cut off. The maximum lateral movement occurred in the pivot pier of the draw span after the weight of new bridge was placed upon it, and amounted to 3 in. in the direction of the stream. Some of the other deep water piers moved about 2 in. in a similar direction when the weight of the bridge was placed upon them. The vertical settlement averaged ¼ in. per each course of timber in the bottom of the caissons, and was the amount allowed for in the construction. Since the traffic has been turned over the structure, which was in July, 1901, no further lateral movement or vertical settlement of the piers has occurred of consequence, and recent soundings show practically no change in the rip-rapping that was placed around the piling. These foundations were put in at a cost of \$100,000, and the total weight of metal in the new bridge is 1,755 tons. Its total length is 755 ft. The draw span was erected on the new protection pier. The four 124 ft. 6 in. fixed spans were duplicates. False work was put in for the erection of one fixed span at each extreme end of the structure. The other two fixed spans were erected on the false work for end span at the west shore of the river, and were lifted from this false work on scows and floated across the river and landed in place.

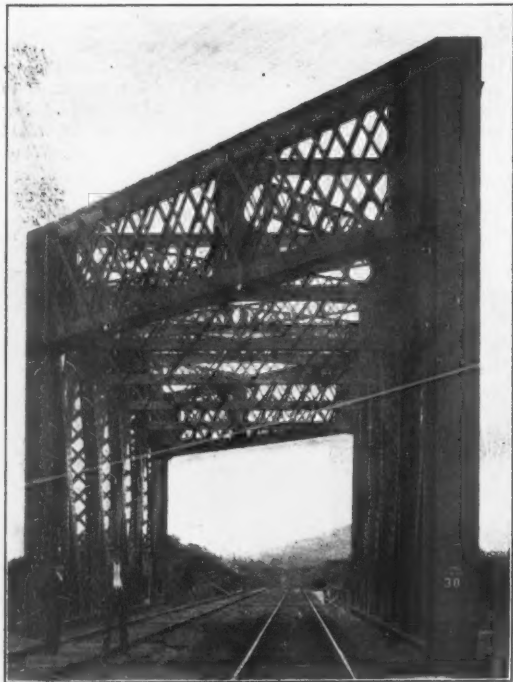
At the lower crossing of the Hackensack River, near Bergen Tunnel, west of Hoboken, N. J., two 201 ft. 3 in. double-track through pin truss spans and one 194 ft. 10 in. double-track through riveted truss draw span have been erected. Owing to the short time, as previously mentioned, when traffic can be blocked in the Hackensack and Passaic Rivers, it will be seen that it would be a physical impossibility to erect a draw span on the site of the old bridge by the ordinary methods of false work. The lower Hackensack bridge is located on the suburban line of the road, and 178 trains cross this bridge a day.

The maintenance of traffic during the erection of the new draw bridge, together with its erection, were the most important engineering feature connected with the renewal of the crossing. On account of the depth of water, which is 50 ft. in the draw channels; height of bridge above the water, and character of the material in the bed of river, with consequent difficulty of getting false work of

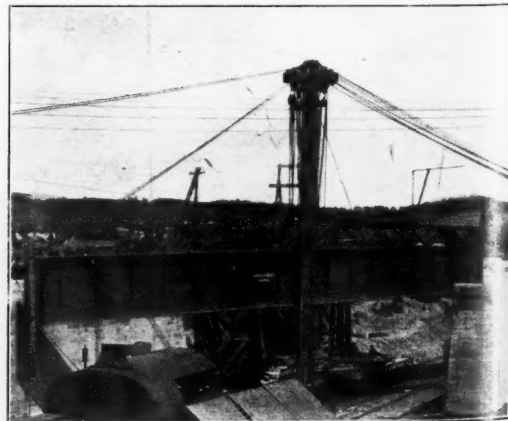


New Double-Deck Draw Over Passaic River, Showing Concrete Center Pier On Which New Bridge Will Be Placed.

bridge were similar to those at the lower Hackensack crossing, and the same method was adopted for moving the old bridge out and the new bridge in. The chief difficulty to be encountered in an operation of this kind, where there is tide water, is due to the erratic variations in the heights of the tides, and the fact that the tides place a time limit on the different moves to be made. Daily readings of high and low tides were taken for a period of three months prior to the move, and it was found that frequently the high tide did not rise above 0 or mean tide, and quite often the high tide rose 4 ft. above mean or 0 tide. A number of these readings also showed that there were several days in which low tide did not fall below mean tide, and other readings showed a low tide 3 ft. 0 in. below mean time. From this it will be seen that the maximum and minimum variations between high and low tide were 7 ft. 0 in. and 0 feet respectively, and that this erratic variation was the chief factor that might jeopardize the success of the undertaking. The average variation between high and low



Bridge No. 30, Buffalo Division, Over Erie R. R. and Parschall's Cove.



88½-ft. Plate Girder for Highway Bridge Lifted With a 50-ft. Gin Pole. Weight of Girder, 35 Tons.



tide readings under normal conditions were 5 ft. 0 in. To insure the success of the operation, the false work trusses on the scows had to be built of such height that the scows could be placed under both the old and new bridges at low tide, which might be at a height of mean tide or might be three feet below mean tide. At the same time the new bridge must be lifted high enough so that when floated in over the center pier it would clear the pier at the lowest high tide that might occur, which was 0 or mean tide. The work was planned on the assumption that the worst conditions would be encountered, and, as a matter of fact, on the day that the bridges were moved low tide fell only 4 in. below 0 or mean tide, and high tide reached a point 3 ft. 10 in. above mean tide. This extreme high tide delayed the releasing of the scows from underneath the new draw bridge after it was landed on the pivot pier, and required a longer time to complete the operation than it would have required had the high tide been normal. Had not the plans been prepared on the assumption that the worst conditions indicated by the readings would occur, the bridges could not have been moved on the date set. The old bridge was lifted from its bearings on four scows, and moved out of the way along shore. It was later landed on the false work on which the new bridge had been erected and was there dismantled. The new draw bridge was erected on false work along the shore and floated into place on four scows, each scow being 29 ft. wide, 90 ft. long and 9½ ft. deep over all. The lifting of these bridges from their supports was accomplished by pumping water ballast from the scows with centrifugal pumps. In moving the new draw bridge the total weight carried above the decks of the four scows was 1,220 tons, and the top chord of the bridge when afloat was 66 ft. above the water line. The weight of the new draw bridge itself, including timber deck and rails, was 845 tons. A volume of water equivalent in weight to 845 tons was let into the scows before the new bridge was lifted, which left the scows with a freeboard of 23 in. when the pumps were started. It took 45 minutes continuous pumping with four centrifugal pumps having 8 in. suction and 6 in. discharge pipes to

completed, resulting in the abandonment of 893 lineal feet of double-track iron trestle bridge. One of these old structures is 124 ft. high, and the other is 157 ft. high.

Paradise Tunnel, which is located near the summit, east of Scranton, is to be made an open rock cut, and work on this is now three-fourths completed.

#### TRACK ELEVATION THROUGH NEWARK AND HARRISON.

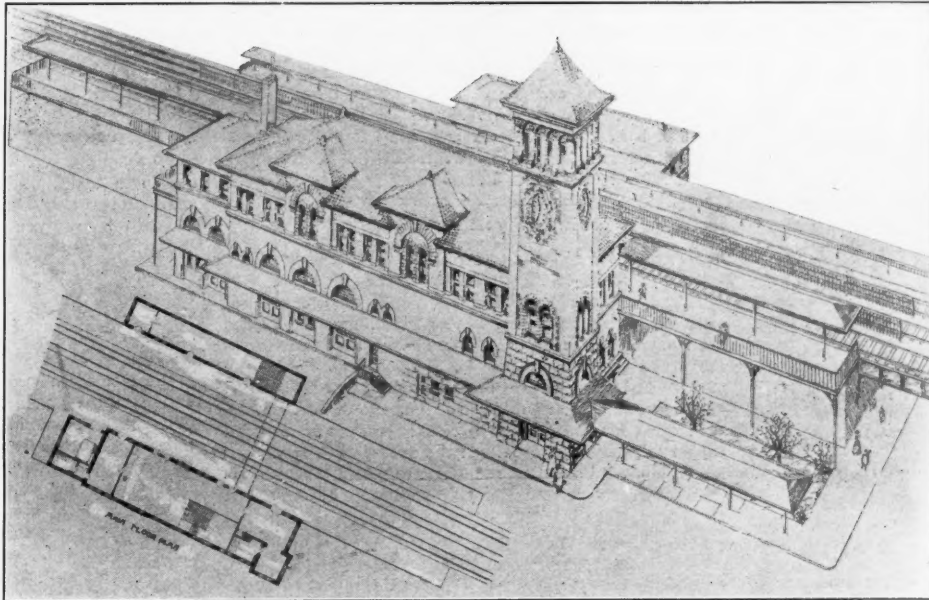
The dividing line between Harrison, N. J., and Newark, N. J., is the center line of the Passaic River, Newark being located west of the river. The main suburban line of the road passes through Newark and Harrison. At present there are 13 street crossings in Harrison, nine of which are at grade and four subways under tracks. In

the city of Newark the railroad tracks cross 27 streets, all of which are grade crossings, with one exception. There are 172 passenger trains and six freight trains passing over the line each day. When the contemplated improvements have been completed all the grade crossings in Harrison will have been eliminated, and only one grade crossing will remain in Newark. From the easterly limits of Harrison to High street in Newark, a distance of one and one-half miles, the tracks of the railroad will cross above the streets. From High street west to the city limits, on the main line and Montclair Branch, the railroad tracks will be depressed between retaining walls with street crossings overhead. The elevation and depression will be for three tracks.

In connection with the work of elevating and depressing of tracks, a new passenger station, new freight house, express building and freight yard are to be built in Newark, and a new station built at Harrison.

The present maximum grade of the railroad through Newark is 138 ft. to the mile, and when the track elevation is completed the grade will be reduced to 60 ft. to the mile, and the alignment very much improved.

At the Passaic River crossing the bridge structure will be double deck. The river crossing proper will consist



Passenger Station at Newark, Now Building.

The company's lines reach the Portland cement regions of New York, Pennsylvania and New Jersey, and all of the masonry (except 3,172 cu. yds.) has been built of Portland cement concrete. During the year 1900 there were 25,875 cu. yds. of masonry laid, of which 12,416 cu. yds. were done by contract, and 13,459 cu. yds. by the Bridge and Building Department of the company. In 1901 there were 49,923 cu. yds. of masonry laid, of which 9,874 cu. yds. were done by contract, and 40,049 cu. yds. by Bridge and Building Department. For the year 1902 no contracts have been let for masonry construction, with the excep-



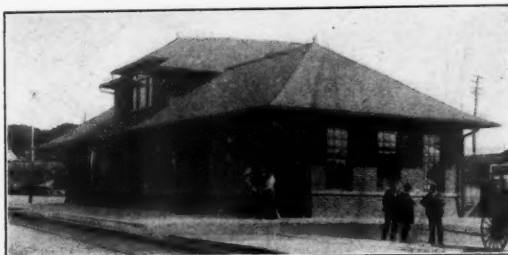
Dover Station.

lift the new bridge from its false work. The pumps were run at a safe and conservative speed, and each pump removed 1,250 gallons of water per minute without any stoppages for the entire 45 minutes, at the end of which time all of the water was out of the scows. In other words, the four pumps increased the buoyancy or lifting power of the boats at the rate of 37,500 lbs. each minute for the entire time. By the time sufficient water had been removed from the boats so as to transfer the load from the false work to the boats the tide had risen 9 in., leaving a freeboard of 14 in. The time required to move the old bridge out and the new bridge in, raise the two 108 ft. deck truss approach spans 18 in. and get the new bridge in shape for traffic was 12 hours, which was within the limits of the time schedule set for doing the work and the resumption of traffic over the bridge.

The new line of the Newark track elevation crosses the river 35 ft. farther north and parallel to the present center line of tracks. The double-deck draw bridge when utilized in connection with the elevation will have to be moved 35 ft. northward and lowered down 10 ft. 6 in. The weight of the draw bridge with additional parts, including both of its timber and metal decks complete, will be 985 tons, and the moving of this bridge to the new line and lowering it down 10 ft. 6 in. will be an important engineering feature connected with the Newark track elevation, as it must be completed inside of 12 hours to follow the action of the tides, and it will also be necessary to avoid interference with traffic as much as possible.

Near Dansville, N. Y., two large fills have just been

tion of that for the Newark track elevation. About 40,000 cu. yds. of masonry will be completed during the season of 1902 by company forces, making an approximate total of 116,000 cu. yds. for the three years, not including the Newark track elevation. Of this total



Washington Station.

about 90,000 cu. yds. is for bridge substructures, and the balance for engine house foundations, retaining walls, cinder pits, etc. The fact that all of the erection of steel bridge work in 1899 and first half of 1900 was done by contract, while all erection of steel work is now being done by the bridge and building forces, together with the above statements regarding masonry construction for the three years, illustrate clearly the development of the policy to do work with company forces rather than by contract.



New Station at Binghamton, N. Y.

of one 221 ft. double-deck draw bridge, and two double-deck approach spans, with steel trestle work on either end of the approach spans. The top deck of these structures will be double-track and for passenger service, and the lower deck will be single track for a freight line into the new freight yard at Newark.

In the Newark and Harrison track elevation work there will be about 109,000 cu. yds. of masonry, and 6,250 tons of steel work for bridges. The work on this improvement was begun early in 1902, and the contemplated improvement will be completed in about three years, and will cost about \$3,000,000.

#### BUILDINGS AND STRUCTURES.

Statistics of the new structures of various kinds which have been built in the last three years show eight new engine houses, with a total of 139 stalls, and three more engine houses now building. Ten brick and 10 frame station buildings have been built at a cost of \$215,000, and two more brick stations are under contract. The new structures have improved greatly the appearance of the line, besides providing for the convenience of patrons, and a number of characteristic examples are shown in the photographs, of which the proposed Newark station and the one recently completed at Binghamton are especially noteworthy. Five new brick freight houses, fourteen 60-ft. turn-tables, nineteen 100-ton track scales, eight concrete ash pits, seven new engine coaling stations and five new retail coal trestles have also been built, at a total cost for freight houses, turn-tables, etc., of \$279,400.

The yards at Hoboken have been entirely remodeled



by the removal of the old office and freight building from a central location in the old yard, to a location on the street lines, and 70 miles of tracks have been laid in the rearrangement of the terminal, including changing the main tracks of the passenger yards to take out curvature, and relaying with new 80-lb. rail; change of the coach yard where additional tracks were put in, etc.; laying all main tracks in freight and coal yards with 75-lb. rail, equipping with the latest type of slip switches, point switches and standard plate riveted frogs made at the company's shops. The new buildings at Hoboken include a long two-story brick structure for railroad offices and the express company, a new freight house, a three-story fire-proof building for the storage of the company's records, a new carpenter shop with modern equipment, for the bridge and building department, the rebuilding of four large piers, on one of which a freight house 78 x 1,280 ft. is building, extensive repairs to four other piers and a new locomotive coaling station, etc. Dock work contemplated for the near future also includes a new gravity coal shipping pier at a cost of \$175,000. The total amount already spent in the renewal of buildings is \$1,912,000, and about \$500,000 additional is to be spent on new car shops, etc., at Scranton.

Changes in the water supply which, as stated, was inadequate for the new equipment and enlarged scope of business, resulted in building 49 new water tanks, 52 water columns, 19 pump houses, six deep wells, five steel stand pipes and four reservoirs.

Since 1899 \$500,000 has been spent in modern equipment of automatic block signals, interlocking devices, etc. At Hoboken a 38-lever electro-pneumatic interlocking plant was installed controlling all passenger train movements at the terminal, 323 miles of the line reckoned on a single-track basis, have been equipped with new automatic block signals, and on the entire system 335 train order signals, 25 interlocking plants, with 583 levers and 432 automatic semaphore posts, with 775 signals, have been installed. All fixed signals on the entire system were changed from white for clear and green for caution, to green for clear and yellow for caution.

Prior to Oct. 1, 1899, the Road Department was under the charge of division roadmasters, nine in all, who reported to the division superintendents. In September, 1899, Mr. W. K. McFarlin was appointed Chief Engineer of the system and all maintenance and construction work is under his supervision. Mr. L. Bush is Principal Assistant and Bridge Engineer, and has been with the company since December, 1899. Mr. A. J. Neafie is General Roadmaster, and has served in that capacity since October, 1899. An inspection tour and inventory disclosed the fact that some divisions held thousands of tons of rail piled up which were badly needed on other divisions. A general transfer of this rail was at once begun and the renovation of yards, building of additional track facilities and improvement of line started for the handling of heavier locomotives and larger train tonnage. Since Oct. 1, 1899, 288 miles of main track has been relaid with new 80-lb. steel rail. This has released 75 lb., 70 lb. and 67 lb. relaying rail which has been utilized for new yard work and switch and shop work. In this renovation considerable small rail was released out of yards, placed on the market and sold at times when the market was up, bringing in a good revenue. From Oct. 1, 1899, to Sept. 1, 1902, 309 miles of new 80-lb. steel rail, 1,763,143 cross ties, 7,021,738 ft. of switch timber and the necessary track fastenings have been received and used on the line in new work and betterments. On account of the large amount of new frogs, switches, crossings, etc., which would be required to carry on the work, it was decided to open a frog and switch shop at Kingston, Pa. Since it was completed, in February, 1900, all crossings, frogs, switches, insulated joints, slip switches, cattle guards and all roadway work used on the system has been turned out at this shop, to the extent of 4,303 frogs, 3,575 switches, 3,981 guard rails, 888 switch stands, 55 slip switches and crossings, 3,264 Neafie insulated joints, and 201 cattle guards. A number of small bridges have also been built, together with considerable minor work done for other departments. The making of track bolts and all tools for the system is now under contemplation, and part of the machinery necessary to equip the shop for this purpose has been ordered.

Exclusive of the work at Hoboken, a new terminal with a small yard was opened up at Wallabout Basin in Brooklyn in October, 1900, and passenger or freight yards have been built, or are now building at South Orange, Morristown, Passaic, Dover, Secaucus, Portland and other points. At all the important stations on the line the track facilities have been carefully looked over, and, in general, put in good condition, together with very general use of heavier rail.

The general policy of the management to bring out industries along the line has resulted in the building of a number of spur tracks to old and new industries at numerous places, so that the industrial department of the railroad is an essential feature of great value to the interests served, while the counter policy of leaving to others such service as can be rendered satisfactorily for the present, and more cheaply to the consumer, has resulted in very little building of branch lines into the territory of competitors. Interesting improvements, which it is impossible to take up in detail, have been made in connection with the ice shipping industries on Pocono Mountain, the cement regions in eastern Pennsylvania and western New York, the coal mining interests in the

Lackawanna and Wyoming regions, and the numerous manufacturing industries in northern New York State and elsewhere.

Ballasting of the roadbed has been done little by little and is constantly in progress. On the plains in the southern part of New York, beyond Binghamton, gravel is used almost entirely, and its use is extended as well on the divisions to Syracuse, Utica and Ithaca. Broken stone is being used somewhat on the Morris & Essex, but it does not total up to any considerable amount. There is no question, however, that the Lackawanna road, which early in 1899 was equipped with light rolling stock and weak bridges, and was generally in poor condition, stands now in admirable shape to handle the kind of traffic which it is best adapted to reach, and has an important place as a carrier, owing to the directness of its transportation route to the Great Lakes.

#### Railway Signaling Club.\*

##### Report on Cost of Installation of Iron and Copper Wire for Line Circuits, and Battery on Same.

This Committee submitted a series of questions to all railroads which have automatic signals, and the replies are summarized at length. These cover the statistics of the practice of a dozen roads, more or less, in the use of wire lines, in addition to the track circuit, to control automatic signals; in the use or non-use of common return wires for two or more circuits; the sizes of iron and copper wire used in signaling; the average life of various kinds, insulated and bare; and experience in sleet storms. The committee presents data from a selected stretch of automatic signals equal to 210½ miles of single track road. The signaling in question is of the home and distant type with both signals on the same mast. The cost of iron and copper wire on which calculations are based is the present market price, viz., 4½ cents a pound for iron and 13 cents for copper. Figures for stringing the wire are \$5 per mile for iron and \$4 per mile for copper. Total length of track protected, 210½ miles, number of signals 86, cells of battery 1,842, average number cells of battery per mile 9, average length of block 13,450 ft.

From the data gathered the following conclusions are offered:

##### Line Wire.

Where No. 8 iron for common and one No. 10 iron for signal circuits are used, the average cost is \$23.83 per mile per wire for construction; No. 8 iron common and two No. 12 copper signal circuits \$25.27 per mile per wire; No. 8 iron common and one No. 10 iron signal and one No. 12 copper signal \$24.10 per mile per wire; No. 10 copper common and two No. 12 copper signal, \$28 per mile per wire; No. 10 copper common and one No. 12 copper signal \$29.75 per mile per wire.

##### Battery Installation.

Where No. 8 iron for common and one No. 10 iron for signal circuits are used, the average number of cells of battery per mile is 15 at \$2 per cell, \$30; No. 8 iron for common and two No. 12 copper for signal circuits, 11 at \$2 per cell, \$22; No. 8 iron for common, one No. 10 iron signal and one No. 12 copper for signal circuits, 10 at \$2 per cell, \$20; No. 10 copper common and two No. 12 copper for signal circuits, 8 at \$2 per cell, \$16; No. 10 copper common and one No. 12 copper for signal circuits, 8 at \$2 per cell, \$16.

##### Battery Maintenance.

Where No. 8 for common and one No. 10 iron for signal circuits are used, the average cost per mile for maintenance of battery is \$18 per year, for material; No. 8 iron common and two No. 12 copper signal circuits \$13.20; No. 8 iron common, one No. 10 iron signal and one No. 12 copper signal \$12; No. 10 copper common and two No. 12 copper signal \$9.60; No. 10 copper common and one No. 12 copper signal \$9.60.

These figures represent the cost of line wire and the stringing of same, exclusive of poles or pole line fixtures. The figures for battery represent the delivery of an average of 120 mil-amperes of current through the signal instrument. It should be remembered that these figures do not represent the installation of a mile of automatic signal protection, but only the wire and the necessary current to properly operate the system.

H. S. Balliet, W. A. D. Short, Committee.

The committee on organization, E. B. Ashley, Chairman, made a report embodying judicious recommendations for the conduct of office and outdoor work, and the management of men. As the matter is too "solid" to be condensed into the space here available, we quote only the concluding paragraph, which is one of the best in the whole report: "The division supervisors or inspectors should examine the men under them frequently so as to assure themselves that their forces are fully cognizant of all rules and orders that may be issued from time to time by the operating department which might affect them."

##### SIGNAL CIRCUITS.

Two members of the committee on this subject, Messrs. J. C. Mock and W. E. Foster, made a report declaring in favor of the three-position automatic block signal and the "normally clear" arrangement. Following are extracts from the report.

The Three Position Signal combines in its one-arm and one-lamp, all the functions of a two-arm and two-lamp (Home and Distant) two-position signal. Its day and

\*Mr. Ellicott's paper and the reports on crank and compensation motion, and on power interlocking, were given last week, pages 852 and 853.

night indications ("Danger," "Caution" and "Clear") are consistent and in harmony with interlocked signals. It reduces the number of lamps and arms and requires no more controlling appliances or complex mechanism.

We favor as nearly a uniform block of three-quarter mile as conditions permit, reducing the distance slightly for up grades and increasing it slightly for down grades so as to preserve a practical uniform time interval between trains, at the same time giving sufficient space for the swiftest and heaviest trains to be brought to a stop.

We favor the semaphore, operated wholly by electricity, believing it to be just as efficient in operation and more economical than any other automatic signal of semaphore type. We prefer the semaphore type to the disk or banner. We favor the Normal Clear Position because (a) the controlling circuits are simpler; (b) the signals are more readily inspected and consequently easier to maintain; (c) less liable to derangement from lighting (because less apparatus and less line wires are exposed). We believe these things outweigh the claims (a) that the normal danger is the consistent position (with relation to interlocked signals); (b) is (or should be) more economical in battery consumption; (c) is less liable to give false clear indications due to defects or inclement weather affecting the signals proper.

We think it a wrong principle to pass danger signals. If the "setting point" is far enough in advance [rear] of a signal to enable an engineer on a train running 60 miles an hour to see the signal set—in foggy weather, he may not see the signal in the clear position.

We favor the storage battery. For only two tracks where the blocks are more than one mile long, we do not unqualifiedly advocate the use of storage battery charged with power line, because the interest and depreciation on the extra equipment is such a big factor that the economy over the primary battery method is doubtful.

The Michigan Central has a system of approximately two mile blocks. Signals are (one-arm) "two position," the distant signal located about 3,500 ft. from its home. The yearly cost for maintenance and operation of each signal is about \$67. Ten dollars of this is charged to battery consumption for operating signal, primary battery being used costing about \$5 per k.w. hour. If electric power at 5 cents per k.w. hour could be had (a common rate for lighting and power) the operating power for each signal would cost 10 cents a year, reducing the total cost of maintenance and operation 16½ per cent.

Suppose we install a power line and station and transmit current for charging batteries over 40 miles (20 miles each way), this extra equipment we will say costs \$6,000; interest at 5 per cent.—\$300 depreciation; 10 per cent.—\$600; total, \$900. Cost to furnish 160 k.w. hour at 5 cents, \$8. Total cost per year to furnish current for 80 signals, \$908. Cost with primary battery at \$5 per k.w. hour, \$800. Difference in favor of primary battery arrangement, \$108.

It is obvious that we have a big man doing a small boy's work. But there is other work to do. There are track sections which cost about \$5 a year for battery, and signal lamps that cost a couple of dollars a year for oil; which require daily or semi-weekly attention, and even then are frequently extinguished by storms. These two items should be added to the work of the power transmission outfit. The best solution of the question seems to require the perfecting of alternating apparatus, namely, the signal motor, the switch indicator and the track relay. We can then dispense with all battery and oil lamps. With such an arrangement we believe the cost of maintenance and operation for automatic signals can be reduced 50 per cent.

We are disposed to favor the wireless method of controlling distant signals. It has been found reliable and it brings within easy reach all apparatus needing frequent inspection, reduces the amount of depreciable material and affords some immunity from lightning. On the other hand it requires a slightly less efficient and more complicated track relay and does not afford as good opportunities for rendering harmless those disturbances which are due to foreign currents on the track.

For Lightning Guards we favor the Choke Coil and Spark Gap. This type of arrester if scientifically designed and applied, affords protection. Fuse wires are annoying, causing many unnecessary delays and do not afford absolute protection against damage to relays and signals. The recent improvement in track relays by use of carbon for contacts and high insulation between coils and core has reduced the lightning trouble so that in many sections we may safely omit lightning guards.

The Miniature Signal is the best switch indicator. We favor switch indicators. There is scarcely any more excuse for omitting switch indicators than there is for omitting dwarf signals in an interlocking plant where reverse and subordinate movements are made. Every entrance to a block should be signaled. Switch indicators facilitate traffic by giving important and necessary information to a train about to enter a block from a switch. We prefer the miniature signal to a bell, because its office is more important as a signal than as an annunciator. A bell not ringing (out of order) is equivalent to a clear indicator.

An indicator (out of order) stands at danger. Indicators can be worked in series or multiple by one battery, whereas, bells to work satisfactorily require local battery for each. The bell is a better annunciator and may be located farther from the switch or serve for a group of switches and is as good at night as in daytime.

Switch Boxes—Shunt (only) track circuits. This



method is effective. The switch indicator is present to show whether or not the switch box is properly performing its work. Breaking the track circuit is never used alone because it is not reliable and it is practically discontinued in connection with the shunt.

We favor track circuit equipment for all crossovers between main tracks and between a main track and side track.

The club should adopt standard nomenclature, standard symbols, representing the various apparatus incorporated in a standard circuit plan with tracks drawn to longitudinal scale (not smaller than 1,000 ft. to the inch) with two lines to represent each track, upon which shall be marked all switches, crossing bells, stations, mile posts, road crossings, overhead bridges, insulated joints and all circuits complete including line, track (underground) and local wiring. It should be not merely a diagram of circuits but a complete wiring plan. Next year the committee intends to present to the club their recommendations for standard circuit plans, and each member is invited to contribute information.

The report then goes on to describe the block signaling on the Eastern Division of the Pittsburgh, Fort Wayne & Chicago (mostly four-track) which is already familiar to readers of the *Railroad Gazette* (see Jan. 18, 1901). The expense of maintenance and operation of this plant (three-position signals) during the past year for 188 signals, has been \$5.45 per signal per month. With the three-position system one signal is equivalent to two where home and distant signals are used and the comparison of expense should be made accordingly.

#### Signaling on the Lackawanna.

In response to the inquiries of the Committee of the Railway Signaling Club, Mr. A. H. Rudd, Signal Engineer of the Delaware, Lackawanna & Western, has sent the following account of the practice on his road, which will be found of general interest.

We use home and distant automatic semaphores. Night indication: red for danger; green for clear; yellow for caution. Arms spaced 6 ft. centers. Length of block not less than the distance in which any train can be stopped after passing distant signal (depending, of course, on grades and local conditions). Blocks not to exceed 1 1/4 miles in length, so that track circuits do not need cut sections. These are operated by four cells of gravity battery in series multiple.

Crossing bells are operated on track circuits with battery at the far end of circuit and relay at bell. Distant signals at such points are operated by wire circuit, the line wire being broken through the different track relays. Signals themselves are controlled by 500-ohm relays in circuit with line. At all other points the wireless circuit is used with 3 1/2-ohm high grade insulation track relays, and choke-coil spark-gap arresters, without fuses.

We use normal clear, signal setting to danger as engine passes. Either switch of a cross-over shunts both tracks, although we may later track-circuit the cross-over rails. Siding switches shunt main track, and fouling sections are provided. We use potash battery in signals. A power line with storage batteries would be better, but it is not warranted, in the present state of the art, for anything less than four-track block work.

We do not use switch indicators. With rules rigidly enforced, if out of order, they seriously impede train movement. A good trainman will always flag back and does not need them; a careless man ignores them. We have proved this in actual practice, as we had 150 in service and removed them all.

At interlockings, the automatic distant is controlled by the wireless circuit, a 500-ohm relay at the home signal changing the polarity. This 500-ohm relay is operated on line circuit, the latter breaking through the circuit closers on all main line home arms and on the automatic advance signal; also through a hand switch in the interlocking station.

Home arms are slotted.

Electric locks are so applied to home signal locking that after a train has entered indication circuit, perhaps a mile in rear of the distant signal, the home signal may be put to danger; but the latch cannot be put normal, and, therefore, the route cannot be changed.

To avoid delays, should switching movements be necessary, mechanical releasers are provided for the use of operators. We have yet to add an interlocking attachment whereby the home signal lever is locked, as noted above, should the automatic distant by any possibility fail to assume the normal position properly, although we have never had any trouble from this cause.

**Interlocking signals.**—Independent dwarf signals are used for reverse movements on main tracks and for movements on sidings. The night indication is blue for danger, green for clear. We shall make this change the coming winter.

Home signals for high-speed diverging routes have arms spaced 12 ft. centers, making a distinction between such cases and home and distant arms spaced 6 ft. centers. The lower light is blinded when its arm is normal, so that a through main line engine does not run against any red lights except those which govern him. An engine using a diverging route receives a high red and a low green. Where the diverging route is slow speed, a one-arm home is used with a dwarf signal at foot of post. The latter has the light blinded as noted

above. The lower the arm or light, the slower the speed. Top arm in all cases governs main running track.

By this arrangement a main line runner never has a red light against him unless it is necessary that he should stop. It is possible that we shall carry this arrangement to its logical conclusion by blinding the upper red light, and displaying a white marker light above the green when the latter is clear for diverging route, although we find that the present arrangement works out very well in practice.

#### Electric Switch Lighting—Chicago Transfer & Clearing Company.

In a detailed and illustrated description of the large freight yards of the Chicago Transfer & Clearing Company in our issue of March 14, mention was made of the intention to light the switch lamps of the yard by electricity. There are now some 400 of these switches that

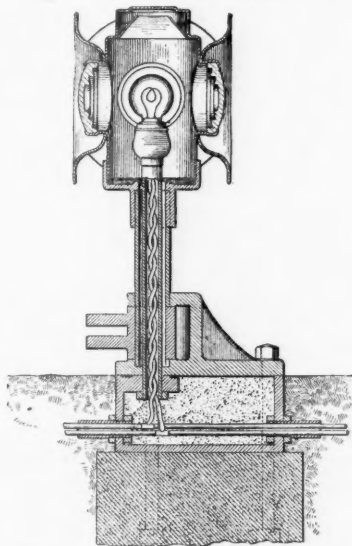


Fig. 1.—Detail of Switch Stand and Connections.

are so lighted, 150 of which are electro-pneumatically controlled, the remainder being hand-throw.

The power station contains two 150-k.w. alternating current generators which are used for lighting the yards and various buildings. The switchboard has a special panel for the switch lighting circuits, of which there are

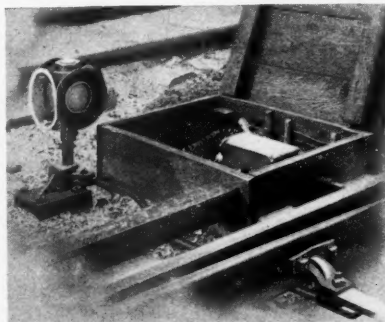


Fig. 2.—Switch Stand Connected to Electro-Pneumatic Switch.

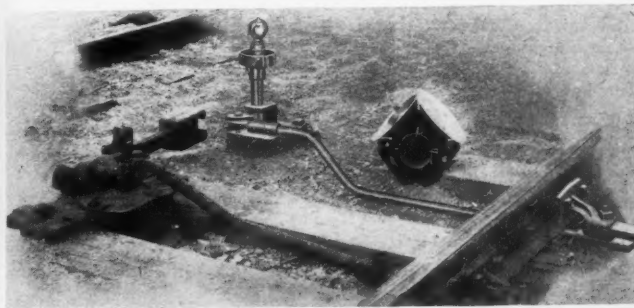


Fig. 3.—Lamp Case Removed.

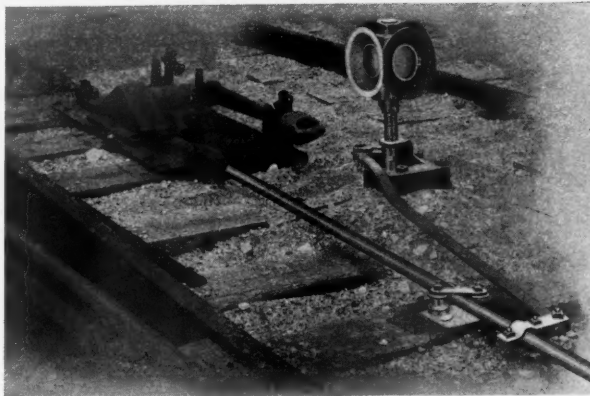


Fig. 4.—Stand Connected for Operation with Puzzle Switch.



Fig. 5.—Stand Moving in Unison with Lever.

four, with an ammeter in each circuit. From the power station these four circuits extend east and west along each side of the yards, the total run for each circuit being about two miles. The lamps are separated into groups, each group consisting of from 10 to 14 lamps. The distributing circuits are carried on 30-ft. poles and opposite each group of lamps a transformer is placed on a pole, from which 110-volt current is carried underground in conduits to the various lamps. Each group may be separately controlled from a service switch located on the pole below the transformer, enabling repairs to be made to any group without disturbance to the remainder.

An installation of this nature must necessarily be of

as substantial and permanent a character as possible. In the design of the switch stand and rail connections the object was to make them as simple and at the same time as durable as practicability would permit.

In Fig. 1 a section of the stand with connections is shown. The stand is mounted on a concrete foundation having a depth of about 3 ft., above which is a cast-iron terminal box, the base of the stand resting upon this box. Anchor bolts for the stand are imbedded in the concrete. The electric conductors, which are lead-encased, are carried in iron conduits beneath the track and pass through these terminal boxes. The underground cable is tapped for the lamp connection in the manner shown, after which the terminal box is filled with a hot, non-insulating compound, making it waterproof and removing liability to grounds at this point. An 8-c.p. lamp is used, care being taken so to place it within the hood as to give a perfect focus. The lamp is supported by a tube securely threaded into the terminal box, which prevents vibration of the lamp and consequent shortening of its life.

The lantern containing the signal lenses is supported upon a tubular post surrounding the electrical conduit, and receives its motion from a lever at its base securely keyed to the post. This lever is in turn bolted to a tie rod connecting with the switch and thus is affected by any motion of the latter. The stand is adaptable to any design of switch, either interlocking, single or double throw. It is claimed that the design of the stand and the method of installation used will enable it to withstand many years of rough usage. Also it is thought that annoyances from grounds and injured wires have been entirely obviated.

Several views of the installation, engraved from photographs, are shown. Fig. 2 shows the connection to an electro-pneumatically operated switch. Fig. 3 shows the connection to a hand-throw switch, and also shows the lamp case removed; the case is attached to the stand by a bayonet attachment. The connection for operating the lamp with a puzzle switch is seen in Fig. 4, while Fig. 5, which gives a general view of one end of the yard, is intended to show the working of the stand in unison with the switch as the lever is thrown over.

The cost of operation of these electric switch lamps in connection with a power plant used for other lighting purposes is comparatively small, and considerably cheaper than by oil when tank houses, the necessary labor and the constant care of the lamps are taken into consideration. The convenience, cleanliness and safety of the system make it very desirable whenever conditions make its use practicable. At night the moment it grows dark the entire yard may be lighted in the time required to throw the four switches at the power station.

As the system is divided into four circuits of approximately 100 lights each, and each circuit has an ammeter, the latter acts as an indicator, showing the condition of the lamps on its circuit. Also the system is so arranged that the installation of any additional switches merely requires the laying of the conduit from the nearest switch box to the new stands without disturbing the other work in any way.

The system has been in operation at the clearing yards for some six months now, and we understand has proven entirely satisfactory in every respect. The scheme and the equipment comprise a patented system developed by the Arthur Frantzen Co., Chicago, who made the installation for the Chicago Transfer & Clearing Co.

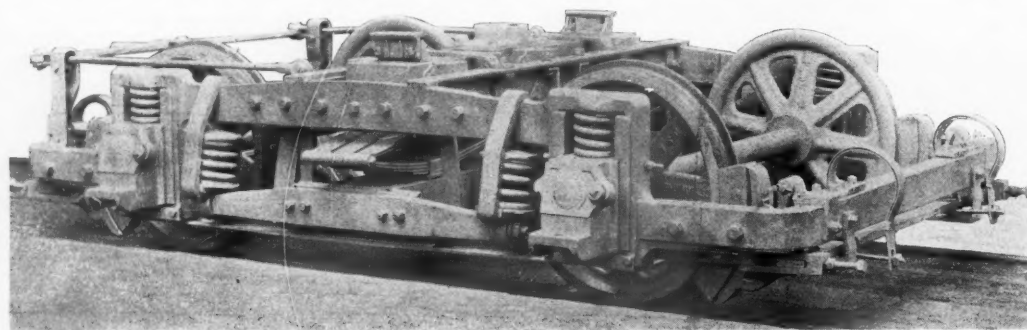


### A Remarkable Truck for Electric Service.

The J. G. Brill Company, of Philadelphia, has recently completed a number of trucks for third-rail electric service, which are of interest on account of unusual size and strength. They are, perhaps, the most powerful four-wheel passenger trucks ever built, being equal in capacity to the large six-wheel trucks used under the heaviest coaches.

The truck is a modification of their No. 27, and is known as "No. 27-E3." The No. 27 truck has long been in use on the Boston and Brooklyn elevated roads, and under many of the heaviest surface electric cars, and has gained a high reputation for safety, strength and easy riding qualities, due chiefly to the system of equalization, and to the solid forged frame.

The solid forged side frames of this truck have never been equalled in previous trucks. They are in the same class with heavy locomotive frames, and are only to be compared with them. The necessity for great strength is apparent when it is understood that the trucks must withstand not only half the weight of a 100,000 lb. car, but the torque of two 160-h.p. motors as well. Each truck is, therefore, a powerful locomotive, and it is evident that to hold the axles parallel and the machinery in alignment under the severe stress, a framing is required equal in strength to that of a locomotive. The



Brill No. 27-E 3 Truck.

Temporarily mounted on 33-inch wheels for photographing. The wheels are to be 41-inch steel-tired.

frames of these trucks are not spliced, as in locomotive practice, but are one solid forging, side bar, yokes and extensions. The length over all is 12 ft.  $\frac{1}{2}$  in. The side bars are  $1\frac{1}{4}$  in. thick and 7 in. wide, tapering to 6 in. at the yokes. The pedestals are  $20\frac{3}{4}$  in. long, 4 in. thick and  $2\frac{3}{4}$  in. wide. The pedestal bearings are 5 in. wide and  $1\frac{1}{4}$  in. thick, and the extensions are  $1\frac{1}{2}$  in. thick.

The manner in which the side frames are connected affords great strength and squareness. The angle-iron transoms are bracketed on both sides to the side bar by double-corner brackets, placed between the transoms and secured thereto by two  $1\frac{1}{32}$  in. bolts on each side, and to the side bars by three bolts of the same size. These brackets are forged from single billets, and are 1 in. thick and 6 in. wide. Single-corner brackets of the same width and thickness are secured to the outside of the transom in a similar manner. The end pieces are of heavy angle-iron bent around and bolted to the side frame extensions. Angle-iron tie-bars complete this singularly powerful frame.

The elastic suspended bolster is carried on equalizing bars supported at their ends by spring links hung on the side frame at points near the yokes. This method affords a cushioned side swing and distributes the load equally upon the wheels, at the same time providing leverage in favor of the frames against the wheels and brakes. No matter how violently the brakes are applied the frames cannot tilt. The equalizing bars are 5 ft. 4 in. long,  $2\frac{1}{2}$  in. thick and  $5\frac{1}{2}$  in. deep at the center. The bolster is carried on two triple elliptic springs and the equalizer and box springs are double coil. The brake rods connecting the beams with the upright levers are placed outside the wheel treads to give the motors the full width between the wheels. The journal boxes are extra large, and have a strong lip for the bar holding the third-rail contact apparatus. Some of the general dimensions of the truck follow:

Weight without motors, 14,000 lbs.; wheel base, 7 ft.; gage, 4 ft.  $5\frac{5}{8}$  in. between flanges; diameter of steel-tired wheels, 41 in.; length of axles, 7 ft.  $3\frac{3}{16}$  in.; diameter of axles,  $6\frac{1}{16}$  in.; journals,  $5\frac{1}{4}$  in. x  $9\frac{1}{16}$  in.

These trucks were built for the Mediterranean Thomson-Houston Electric Company, and are for service on the Milan-Gallarate Railway.

The photograph given herewith shows the trucks mounted temporarily on 33 in. iron wheels. The service equipment, as noted, will be 41 in. steel tired wheels.

### Improvements on the Great Northern.

Two or three weeks ago we gave a considerable analysis of the thirteenth annual report of the Great Northern Railway Company. The pamphlet report contains particulars of recent improvements, some of which particulars are given below:

Of the total new equipment undelivered at the close of last year and ordered this year, the following had been received and taken into account at the close of this year: Sixty-six locomotives, 62 passenger equipment cars, and 2,200 freight cars, mostly of 40-tons capacity.

There was expended during the year for equipment

\$3,137,273.92, of which amount \$2,696,389.07 was charged to "Equipment Account."

The work of enlarging the division terminal at Havre, Mont., has been completed, there having been built a new yard, 23-stall roundhouse with turn-table and cinder pit, water supply, 20-pocket coaling station, sand house, machine shops, etc.

The division yard at Everett, Wash., has been completed, containing 23,100 ft. of track, 15-stall brick roundhouse with turn-table and cinder pit, water supply, 20-pocket coaling station, brick machine shop, etc.

The yard at Stony Brook, Minn., has been revised and 6,390 ft. of additional track laid, 15 pockets added to the coaling station, the water supply improved and the buildings relocated.

Many passing tracks between Crookston and Cass Lake, Minn., have been extended to a length of 4,000 ft. The laying of additional passing tracks 3,000 ft. long and the extension of old tracks to that length have been continued during the year, and in addition many house tracks and tracks for local industries have been laid. The net increase in side track mileage during the year, including these tracks and such tracks in the new yards mentioned as were laid June 30, 1902, but not including side tracks on new lines built or acquired during the year, is 73.19 miles.

During the year main line tracks have been relaid as

follows: 9,378 miles with 80-lb. rail, 435,647 miles with  $77\frac{1}{2}$ -lb. rail, 2,413 miles with 75-lb. rail, and 3,818 miles with 60-lb. rail.

On new tracks built and tracks relaid tie-plates are being used as rapidly as they can be secured; the total number of plates in tracks June 30, 1902, is approximately 6,500,000.

The permanent lining of the Wickes tunnel, on the Montana Central Railway, referred to last year, has been completed, and the track through the tunnel relaid with  $77\frac{1}{2}$ -lb. rails, the distance being included in the figures above given.

The work of building new shops at St. Paul is now in progress, the buildings under construction being very extensive.

An electric lighting plant has been installed at West Superior, Wis., for lighting the dock, warehouse, elevators, shops, freight house and division office building.

Dock No. 6 at West Superior, Wis., has been extended 868 ft., additional tracks put in, 600 ft. of coal pockets built, and slip on east side of the dock dredged to a depth of 20 ft.

An incline with pontoon and the necessary tracks for a car ferry to New Westminster have been put in at Liverpool, B. C.

The brick passenger station at Spokane, Wash., has been completed, and new depots have been built at 22 stations. Depots at 16 other stations have been enlarged.

Coaling stations equipped with lifting engines and the necessary tracks have been built at Minneapolis Junction, Minn.; Smith Lake, Minn.; Casselton, N. D., and East Spokane, Wash., replacing stations of an old pattern that had burned. Coaling platforms and sheds have been built at Cambridge, Minn.; Silver, Mont.; Northport, Wash., and Chewelah, Wash.

Permanent improvements in the water supply are being continued, numerous plants, both additional and replacing others, having been built, and improvements made on existing plants.

Right-of-way fence has been built during the year on 361.40 miles. Banks have been widened and raised on 239.02 miles of track, banks restored to grade on 195.40 miles, and track ballasted with gravel on 461.48 miles.

The replacement of bridges and trestles with steel, or filling them so as to make solid embankments, has been actively followed, the total length of steel bridges built being 3,522 ft., and the bridges filled being 13,010 ft.

The following is a close approximation of the quantities of material moved during the year in changes of line, construction of additional lines at Everett, Wash., reduction of grades, widening and raising banks, bridge filling and ballasting: In changes of line, construction, widening and raising embankments, filling bridges and ballasting, 4,099,137 cu. yds. There were also placed 105,369 cu. yds. of masonry.

Following the plan of previous years, only such amounts as represented cost of actual additions to the property have been charged to "Additions and Improvements," and the entire amount charged to that account during the year on account of the line leased from the St. Paul, Minneapolis & Manitoba Railway Company, or

\$1,820,225.11, has been transferred to "Fund for Permanent Improvements and Renewals," so that the Great Northern Railway Company is not carrying on its books, as an asset, the cost of any additions or improvements to the line leased from the Manitoba Company.

All replacements, renewals, etc., have been charged to operating expenses. The amount included in "Maintenance of Road and Structures" this year, for extraordinary improvements, etc., is \$1,663,812.

### The Chicago Hearing on Trans-Missouri Live Stock Rates.

Last week, in Chicago, the Interstate Commerce Commission gave a hearing to the complaint of the Chicago Live Stock Exchange against the railroads in the territory between Chicago and Missouri River packing-house points. The charge against the roads was that lower rates are given on packing-house products in the territory mentioned than are given on live stock, which amounts to discrimination against the live stock interests and operates against the Chicago market for the reason that packers can better afford to convert the live stock into packing-house products at Missouri River points than at Chicago. The complainants invoked a rule of the Commission made in 1890 against the Chicago & Alton which provides that a higher rate shall not be charged for the new material than is charged for the finished product.

At the opening of the hearing the Minnesota State Railroad Commission filed an intervening petition in the case, which asserted that so far as Minnesota rates were concerned they were regarded as being relatively just and that any change made should be with a view to maintaining present relations so far as St. Paul and Minnesota markets were concerned.

The hearing extended over three days and a number of prominent officers of the various roads concerned were called as witnesses. The first of these was Mr. A. C. Bird, Third Vice-President of the Chicago, Milwaukee & St. Paul, who declared that all the freight rates of the St. Paul were too low by comparison, all conditions being considered, and live stock rates especially so.

In reply to this statement the last annual report of the St. Paul, showing good earnings and profits, was introduced. Mr. Bird said it was not just to judge rates by the results of the past two years. The favorable showing now is due to the enormous volume of business. Cattle rates had not for years paid their just proportion of transportation charges and while he approved of the policy of making as low a rate on the raw material as on the finished product if the latter rate is unprofitable he did not believe the former should be forced down to maintain the relation. Of making rates in general he said that the present rates are affected by sharp competition in the affected territory.

On the second day President A. B. Stickney, of the Chicago Great Western, was the principal witness. It will be recalled that Mr. Stickney made contracts recently with all of the packing companies doing business in Kansas City, St. Joseph, Omaha and Sioux City, by which the packers agreed to route a certain percentage of the output of their plants over the Great Western at definite rates for seven years. The circular to stockholders announcing and explaining these contracts was published in our issue of Aug. 15. It has been said that the other roads claimed that the present state of affairs is a result of these contracts of the Great Western.

Mr. Stickney attacked the Chicago Live Stock Exchange, declaring that it is a monopoly that collected over \$3,000,000 in commissions last year on the sale of stock brought to Chicago by the railroads, for which the latter received only something like \$8,500,000. He said the commission charge is \$12 on every carload of cattle and \$3 on every carload of hogs and he considered it remarkable that they should be permitted to continue such practices. Official records for 1901 show that this concern collected 40 per cent. as much on stock yards receipts as the railroads received for carrying the traffic and doing the work. He produced the book of rules of the Exchange, which he said "contains 60 pages of rules, and when you read it through you will find that the only business of this concern is to dock hogs and collect commissions. Rates on almost everything have been reduced, and yet this monopoly demands its usual pound of flesh."

In defending the higher rate on live stock than on packing-house products he introduced figures from which he had drawn the conclusion that at a rate of 20 cents for packing-house products the cattle tariff should be 35.5 cents and hogs 27.9 cents. He stated that higher speeds were required for live stock and a greater risk is involved. He told how the live stock interests of the Northwest had been built up by the railroads, and said, in speaking of his rates with the packers, that they were made after considerable negotiation and that though he had got the best rates he could, he did not consider them unreasonable.

Mr. W. B. Biddle, Freight Traffic Manager of the Atchison, Topeka & Santa Fe, following Mr. Stickney, said that while their rate on packing-house products was the same as the Chicago Great Western, their live-stock rate is 12 cents. He said railroad men generally recognized that rates should be higher on the finished product than on the live stock, the reason being that the stock cars could be loaded for the return journey and were not so heavy. He thought the relation between the rates should be about as shown by those of the Santa Fe.

The figures of Mr. Darius Miller, First Vice-President of the Burlington, also disagreed with those of Mr. Stickney. He said that at even rates he considered live-stock traffic preferable.



The only witness examined on the third day was Secretary Tomlinson, of the Live Stock Exchange. He introduced figures and statistical data in proof of the contention of the Exchange that the present rates on live stock are unreasonably high and operate against the Chicago market. At the conclusion of this testimony the Commission adjourned until Jan. 20, 1903.

#### The Pennsylvania Improvements at Altoona.

From time to time we have published descriptions of the Pennsylvania shops and yards at Altoona. The shops at this place, as is known, are three in number—the Altoona machine shop, which handles all the locomotive repairs on the divisions east of Pittsburgh; the Altoona car shops, at which place about 200 passenger cars and 5,000 freight cars per annum are built; and the Juniata shops, having a capacity of 135 new locomotives per annum.

The Pennsylvania is at present making extensive improvements at all of these shops, and is greatly enlarging the westbound yard. This latter improvement includes changing the direction of the present passenger tracks so that they pass through a tunnel under a neck of the new yard.

A large new three-story tank shop is at present in course of erection at the Altoona repair shops. This structure occupies the space made vacant by the removal of roundhouse No. 2. This new building is a massive steel structure and will be fireproof. The first floor will be used for tender frame and tank repairs. The second floor will be used for sheet iron work and as a cab shop. The third floor will be occupied by a telegraph shop and tin shop. This latter shop is now on the second floor of the old machine shop and is much crowded. This department has gradually grown. At first nothing but the telegraph instruments and accessories were repaired, but now all electrical apparatus connected with the operation of the P. R. R. Div. are included. The space vacated by the telegraph shop will be used by the air-brake department, which is now in the old machine shop, but is much crowded.

The company has also greatly enlarged the No. 2 boiler house at Tenth avenue and Fourteenth street by the addition of four new Babcock & Wilcox boilers equipped with Roney mechanical stokers. This addition makes a total of eight boilers in this power plant. A new dynamo room is also in course of construction near the power house, and the dynamos will be removed from the room now occupied at Ninth avenue and Thirteenth street. Two 300-kilowatt direct-current generators will be installed in this new power house and will be direct driven by cross-compound engines. The current will be used for driving the tools and other apparatus at the Altoona machine shop.

A new power house is being built at the Altoona car shops. Three 250-kilowatt alternating-current generators will be installed. The alternating current will be used at the car shops for driving the tools. The use of alternating currents is practicable at this place owing to the fact that much of the machinery runs continuously and at a constant speed, thus making the use of the alternating current economical.

The Juniata shops are being greatly enlarged, so that the present capacity will be about doubled. Most of the improvements consist of extensions to present buildings. The present blacksmith shop is having a 208-ft. extension built on, and a new blacksmith shop 80 ft. x 200 ft. is to be built. The machine shop is also being extended 334 ft., erecting shop 228 ft., and the boiler shop 176 ft. Three 200-kilowatt direct-current generators are to be installed in the power house at Juniata and will be driven by direct-connected cross-compound engines. The foundations for these are now being placed.

The chemical and physical laboratory at the Altoona machine shop has just received a new piece of apparatus designed for the purpose of photographing the micro-structure of iron and steel. This branch of metallurgy is to be given especial attention, and the apparatus includes grinding machines for finishing the surfaces prior to microscopic analysis.

#### The Fire on the Tower of the New East River Bridge.

As a result of a most spectacular and extraordinary fire, there will be a delay of several months in the building of the Williamsburg bridge over the East River, New York (generally called the New East River Bridge). About 4:45 on the afternoon of Nov. 10, a fire broke out at the top of the Manhattan tower, about 335 ft. above high water mark. On the top of the tower was a wooden platform on which was stored much material used in current work. On the south side of the platform was a tool shed, and on the other side a wooden storehouse. There were here four or five small forges for heating rivets and it is possible that the flames originated in one of these. In the storehouse was much cotton waste and a number of barrels of oil and paint, used for waterproofing the cables.

There was much difficulty experienced in fighting the fire, owing to the fact that but one or two barrels of water were at the top and the height of the structure was such that the hose burst from the pressure. Finally a line of hose was gotten to the top and a small stream of water played upon the burning mass.

The large cast steel saddles, weighing 34 tons each,

which support the cables, had been shored in about six or eight inches by wooden blocks. The fire burnt these blocks and allowed the saddles to move forward to their permanent positions. This movement allowed the large cables to sag slightly in the middle, throwing part of their weight on the temporary foot bridges and broke the small 2½-in. cables supporting them, these cables being already heated. These footbridges were to have been taken down in a few days, as the work for which they were put up had been about completed.

It was thought at first that one or two of the main cables were seriously damaged, in which case the completion of the bridge would have been delayed a year or perhaps more, and the loss might have been a million dollars. Each of the four cables is 18½ in. in diameter and is made up of about 7,700 small steel wires. In an early examination it was decided by Mr. K. L. Martin, Resident Engineer, that some of the wires of the southernmost cable are so much damaged that they will have to be taken out and that the next cable is also damaged. It is not thought that the heat has damaged the cables to any depth, but this cannot be positively known until sections are taken out and tested.

The Bridge Commissioner, Mr. Lindenthal, Mr. Charles G. Roebeling, Mr. L. L. Buck, Consulting Engineer of the Department; Mr. O. F. Nichols, Principal Assistant Engineer and Assistant Engineer Alexander Johnson, in charge of the New York tower for the city, with several others, made an inspection of the tower early in the day. As a result, the Commissioner sent the following report to the Mayor:

The origin of the fire is as yet unknown. From a personal inspection which I made this morning I find that the flames found nourishment in the timber of the scaffolding and the wooden temporary stairway in the southern half of the tower. In ascending from the bottom of the tower (where the fire started) the flames reached the wooden shed on the top, which temporarily incloses the steel wire cable bearings on the towers. In that shed had been stored the materials used in covering the cables, some of which materials are of an inflammable nature.

The fire was hottest at the top of the southern half of the tower. It consumed all the timber, and so softened the wire ropes of the footbridge that they tore apart, and the footbridge fell. That part of the footbridge directly over the river was prevented from dropping into the river by catching on the suspender rods fastened to the main cables.

Three of the main cables have been damaged by the fire at points near their saddles—to what extent has not yet been ascertained—but it will be less than at first supposed. It will be necessary to cut out the damaged wires—probably several hundred of them—and replace the same with sound wires. This work may delay the completion of the structure not to exceed 60 days.

The bracing between the towers has been bent and warped in several places, and it will have to be straightened. A minute inspection of the damage sustained is now being made by engineers of this department. A preliminary estimate of the damage does not exceed \$50,000.

It is almost miraculous that no lives were lost. Had the fire occurred one-half hour sooner, when over 100 workmen were on the footbridges, working on the main cable, great loss of life would have been almost unavoidable.

None of the damage will fall upon the city, which is amply protected in its contract for the work. The principal loss was sustained by the John A. Roebeling Sons' Company, which company has the contract for the steel wire cables.

The fire was of an unusual nature, and probably the first of its kind in the history of metal bridge construction.

Mr. Johnson said that perhaps 250 wires of the large cables would have to be spliced. The footbridge had served its purpose, he said, and the work of taking it down had begun on Monday. The remainder of the work would be done by means of traveling buggies.

Mr. Nichols is reported to have said "that it will require about 30 days to repair the damage. The work will mainly be clearing away the debris. As for the condition of the bridge, the main cables are practically intact, with the exception of a few of the surface wires in the two southern cables. In regard to the waterproofing, that would have been finished in two or three weeks, and was as fine work of its kind as I have ever seen. On some of the cables it is practically intact to within five feet of the tower. In other places, where it was burned away, the canvas covering underneath it was hardly damaged. I think the bridge will be finished on time."

Mr. E. F. Croker, Chief of the Department of Fire, thought that this was the worst fire the Department has had to deal with in years. Access to the top of the tower was very difficult and dangerous and the falling fragments of timber and of hot iron added still greater dangers.

There were many instances of courage, of course; such we may always count on. But Mr. Kingsley L. Martin, Resident Engineer, the son of Mr. C. C. Martin, appears to have particularly distinguished himself by courage and enterprise.

#### The Coal Terminals of the United States.

The report of Lieutenant-Colonel W. B. Constable, R. E., covering the results of his observations in the United States is continued in the issue of *The Engineer*, Oct. 10. This part of his report is given particularly to our methods of unloading coal.

At Baltimore he visited the Baltimore & Ohio docks at Curtis Bay. He found there a long wooden pier with three tracks on it, two for working lines and the other for empties. He said that the railroad officers were certain that they could handle coal quicker and cheaper on that pier than by tipping machinery, the only drawback being the breaking of the coal; but this is reduced by holding up the coal in the chute until it gets near the

place where it is to be deposited. In a schooner of 3,500 tons capacity which he saw loading, 60 men were in the hold trimming. This part of the work determines the speed of loading; 500 to 600 loads of coal were being put into the ship in an hour. The General Superintendent said that the cost of transferring coal from car to ship is not more than 2 cents a ton, including interest on the cost of the plant. At the Lake Erie ports Colonel Constable saw various tipping machines, the working of which is quite familiar to our readers.

The unloading of cars is a very important subject for India and especially for Calcutta, and Colonel Constable has advised the people there who are interested in the matter to prepare themselves to deal with long and heavy cars. The difficulties in the way are not so great as they are in Great Britain and on the Continent of Europe, where all of the fixed structures and the turntables, hoists, etc., have been designed for small cars. He is convinced that coal can be unloaded mechanically in Calcutta just as cheaply as in America, provided large cars are used.

#### The New Works of The Lunkenheimer Company.

On Saturday, Oct. 25, the new works of The Lunkenheimer Company, of Cincinnati, were formally opened and some 3,000 visitors were present. The company has just moved from its old quarters on Eighth street.

The new plant is near Brighton Station in Fairmount, about two miles from the center of the city. The five buildings have cost over \$300,000. They occupy about three acres of ground, while three additional acres provide room for future enlargement. Ample switching facilities are provided. The company endeavored to build what might be termed a model plant and a number of interesting features are noticeable.

The five buildings are occupied by the brass department; the iron department; the brass foundry; the power station; and the office building. All are of pressed brick and steel construction, with roofs of glass, and Ludowici tiling. All buildings are designed for 300 lbs. per sq. ft. of floor load.

The main building is 130 x 180 ft. and is of the gallery style of construction, having a center area 30 x 80 ft. It is three stories high but is so designed that three additional stories may be put on without interrupting the business of the department. The elevators and iron stairs are placed in the central area. A novel type of window is used, having a blind arrangement that it is thought will prove a great advantage in summer weather. One of the interesting features of this building is the adaptation of the 14 large hollow floor-supporting columns ranged around the central area to form part of the hot-air heating system. The bases of these columns connect with tunnels running under the basement floor to the fan. Openings on each floor provide for suitable discharge of the heated air. This arrangement entirely does away with the use of galvanized-iron ducts for distribution of the air.

Electric power and lighting is used throughout the plant. In the power station the boilers are the Babcock & Wilcox type, equipped with automatic stokers. The generating unit is composed of a 300-h.p. compound engine and a 240-k.w., 220-volt three-phase dynamo. For supplying the various pneumatic tools, hoists, etc., in the shops and foundries there is a large Laidlaw-Dunn-Gordon two-stage compressor, having a cross-compound steam end. The endeavor was to make the engine room one of the handsomest in the country. The floor is laid with mosaic tiling and the fittings of the various units as well as the boilers are in keeping with the idea mentioned. The tools are group-driven from induction motors, the latter in most cases being attached to the ceiling and drive the shafting by means of Renold silent chain gear. The motors are both General Electric and Westinghouse types, and the generator is General Electric.

For lighting, the Nernst lamp is used and the arrangement is such that an even distribution of light without shadows is secured; also the illumination is sufficient to make unnecessary the provision of individual lights for operators.

The foundries have such modern equipment as an overhead track system for moving material, smelting furnaces burning crude oil, and such pneumatic appliances as appertain to the latest foundry practice.

The office building is a three-story structure, 50 x 80 ft. The second floor is occupied by the draughting and engineering departments, and the third by the advertising department, and a laboratory and photograph gallery.

A private telephone system is installed, affording means for communication between the departments, or for connection to the city lines from any particular department.

The Lunkenheimer business was established in 1862 by the late Frederic Lunkenheimer, and now employs over 700 men. The product is brass and iron goods, with specialties for engines, boilers, etc., such as brass and iron valves, whistles, injectors, lubricators and oil and grease cups. With improved and increased facilities the company expects to extend this line to include many new engineering specialties, and it has a large foreign as well as domestic trade. There is a branch store in London, although the product used abroad is distributed largely through jobbers. An eastern office is situated in New York.





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#### EDITORIAL ANNOUNCEMENTS.

**CONTRIBUTIONS**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**ADVERTISEMENTS**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.

The November meeting of the Railway Signaling Club is being held at Pittsburgh this week. We go to press too early to give a report of the proceedings, but the papers to be read will be found in this and last week's issues. Some of these papers should be of special interest to superintendents, and we call the attention of such officers to them. The signal engineers discuss some questions on which superintendents probably have well defined opinions even if they do not publish them to the world. In the absence of a live superintendents' society, why should they not get their views before the Signaling Club? A superintendent who does not care to attend the club meetings could speak through his signal engineer. If he has no signal engineer, he would do well to get one at once. Take the question of the distant signal. The gist of the recommendation in the paper on that subject is that appliances fail; men fail; therefore have as few distant signals as you can get along with; and if you must have them, have an electric motor at each signal. The question how few can be made to answer is wholly for the superintendent to decide. If he maintains discipline, he must forego fast time in fogs and snow storms (and at many places even in clear weather) unless he has the distant signals. Electric distant signals are costly; but it is up to the superintendent to have suitable signals or lower speed.

The question of speed directly affects the settlement of a cognate question brought up in another of the Pittsburgh reports, that of Messrs. Mock and Foster, wherein they discuss the length of automatic block signal sections. They recommend 4,000 feet. With each distant signal placed on the home post next in the rear of its own home signal, trains have a minimum distance of 4,000 ft. in which to stop; and it is recommended that this distance be increased slightly on down grades. Some superintendents ought to object to this word "slightly." Speeds around 75 miles an hour are becoming so common that 4,000 ft. stopping space does not afford much margin for uncertainties. It is the superintendent who must protest when distant signals are not placed far enough back. If a distant signal is fixed in the right position for a certain speed in clear weather, when the runner can see the signal 1,500 ft. before he reaches it, the burden is on the superintendent to see that speed is reduced in storms and fogs, and it is by no means an easy burden. Engineers are prone to take chances in such circumstances, and trainmasters prone to wink at such doings. Another point on which superintendents may join with the signal engineers for the promotion of uniformity is the color of distant signals at night. Messrs. Mock and Foster declare in favor of green for all-clear; but this involves the use of something new for distant signals. Shall it be yellow, as in the east, or a combination of red and green, as

seems to be favored by a considerable number in the west? The declaration in favor of the three-position signal cannot be intelligently considered while ignoring this question of a third color. The three-position signals now in use show, at night, red, green and white, but many roads are now strongly inclined toward the abolition of white; and if one would induce such roads to use the three-position signal he must provide a caution indication. As the two most prominent night caution signals (those of the Chicago and North Western and the New York, New Haven and Hartford) are not quite so satisfactory in a three-position signal as when each distant signal is in a place by itself, the spread of the three-position idea would seem to depend on a better elucidation of the color question than has yet been had.

On another page of this issue the reader will find the substance of a lot of letters received from presidents, managers and superintendents, on discipline and inspection in the train service, being comments on the article which we published in the issue of July 18, asserting that discipline was in need of improvement and that the very general lack of adequate inspection seemed to indicate that prominent defects in discipline could readily be cured, or greatly modified. The letters of the railroad officers, except in one or two instances, do not take up those specific features of train work which were shown by the collision record to be in particular need of correction; but the paragraphs quoted from them contain some interesting comments and opinions, and the practice of certain roads is briefly described. Two carefully-written letters, those of Mr. Love and Mr. Davis, are given in full. Mr. Love refers to the psychological aspect of the question of dealing with negligent engineers, an aspect which most of us are prone to look upon as a subtle refinement which cannot be usefully considered in every-day life. But higher refinements are constantly being introduced in the mechanical and artistic departments of the railroad service, and why not in the personnel? The reader of Mr. Love's article should go back and read again the letter of Dr. Scripture of New Haven in the *Railroad Gazette* of Jan. 31 last. Dr. Scripture, who is director of the Psychological Laboratory of Yale University, therein reminds us that the quality of men's brains can in many particulars be tested as readily as the qualities of their eyes, ears, hearts or muscles. In what department of life are brain tests more needed than in high-speed train service?

Another suggestive paragraph in Mr. Love's article is that concerning the average trainmaster's untrained condition. This officer is the one most directly responsible for selecting competent and trustworthy engineers and conductors, and yet, ninety-five times in a hundred, he is qualified for this function only by the experience which he has gained in working as a conductor, engineer or despatcher, and by native ability. Any such thing as special schooling in the art of questioning, or of judging human nature, or special education of any kind, is very rare. Theoretically the trainmaster's acts are supervised, and corrected if need be, by a superintendent, who may be a man of carefully-trained mind, or who at any rate, being usually older, may be assumed to be a better judge of men than the trainmaster; but practically the trainmaster's opinion is very often the one that must really prevail. The superintendent cannot give the time to personally inform himself as to all the necessary details. When the trainmaster really is thoroughly competent for his place, then we have another class of difficulties; first quality men cannot always be put in or retained in the service, because the way is blocked by those of second quality. The article following Mr. Love's tells about this. The author of this second article is in the far West, and some Eastern readers may be inclined to accuse him of making a statement unduly gloomy; but, all the same, it is of the tonic and bracing sort that most of us need once in a while.

The article of July 18 took for its text the record of the worst of the butting collisions that occurred in the quarter ending Dec. 31, 1901. If any one feels that that is now a somewhat ancient date he should reflect that since that time three other similar records, almost as bad, have been put on the pages of history. In the eight months of this year to August 31 the *Railroad Gazette* record has contained 99 butting collisions, and 11 of these, killing 47 persons, have been sufficiently severe and costly to be mentioned in the editorial column. While these 99 have been recorded in this journal, probably ten times that number have been recorded by the Interstate Commerce Commission at Washington. Four hundred

thousand dollars a month is a low estimate of the loss from collisions, month after month; and a considerable percentage of this—say one-fourth—is chargeable to the class which we are considering—bumping collisions. These collisions occur in the running of trains about a hundred million miles a month. The eleven worst collisions in the eight months occurred on ten different roads; and we may remark, in passing, that none of the letters from which we have quoted came from any of these ten roads. As this paragraph is written for the purpose of calling attention to the matter on the first page, we will end it now, lest the reader's time be so exhausted that he will not turn to the other matter; but we must add a single word for the comfort of that superintendent who writes that he cannot instruct his trainmen by lecturing them on the causes of other roads' collisions, because the other roads complain. He did it once and was severely lectured for advertising his neighbor's misfortune or disgrace. The only comfort we can offer is to suggest that our friend talk all the more to his men about their own collisions—and quietly arrange to have some one else talk to them about neighboring roads' collisions.

The fire on top of the New York tower of the New East River Bridge which took place last Monday evening, was a strange event. As a spectacle it was astonishing, not to say appalling. The mass of highly combustible material accumulated at a height of 335 ft., burned for a couple of hours with great fierceness, and the neighborhood was speedily filled with falling fragments of wood and other material, and with pieces of red hot iron and steel. The breaking of the small cables which carried the foot bridges dropped masses of material, the noise of which added to the alarming conditions. It is impossible now to estimate accurately the damage to the main cables. These were subjected to intense heat, but for only a short time, and almost no water could be thrown on them; indeed, the height was such that the hose would not stand the pressure necessary to raise a stream to the fire. It seems quite probable that the heat may not have penetrated far into the mass of these 18-in. cables, considering how short a time the fire lasted. It is certain that the outer strands of wire will have to be taken out and new wire spliced in. It is unkind, even if not unreasonable, to criticize anybody now for this discreditable occurrence, but there appear to have been in it some of the same elements which were present in the explosion in the Park Avenue tunnel a few months ago. Here was a mass of highly combustible material, concentrated at 335 ft. above high water, in such a situation that the burning of this material might do damage amounting to some millions of dollars and cause two years' delay in the completion of the bridge. If it was necessary to accumulate the material at the place in such quantity, it would only have been due prudence to use such discipline and watchfulness as would have made the fire impossible. A watchman would have been justified in clubbing any man who lit a pipe in that place. The accounts say that there was only one barrel of water, which had been placed there for drinking water. Doubtless it would have been impracticable to have a supply large enough to put out the fire after it was well started, but a big tank of water might have kept the fire from getting well started. Probably we are the most careless civilized people in the world, which quality makes our progress rather costly.

#### Annual Reports.

**Louisville & Nashville.**—The annual reports of the Louisville & Nashville Railroad Company are always reasonably complete in information, but this information is supplied almost altogether in summarized statistics or compilations, in some cases quite elaborate. It is not surprising, therefore, that there is no extended reference in the report to the two events of chief public importance bearing upon the company's development which took place in the year. One of these was the issue of \$5,000,000 new capital stock, whose sale by order of the Board of Directors on the open market helped a speculative clique to get possession of contracts for the sale of more than a majority of the railroad company's outstanding stock, enabling them to make an exceedingly profitable bargain by turning over to other purchasers their stock control of this great property.

The second great event was the assumption by the Louisville & Nashville directors jointly with those of the Southern Railway, of about \$12,700,000 of bonds issued to control the Chicago, Indianapolis & Louisville Railway Company which will hereafter be worked under the control of the two Southern railroads, to give them their own entrance from the Ohio River into Chicago. This latter operation, taking place after the ownership of the controlling majority of the stock had been sold, was completed after the close of the fiscal year covered by the present report, and there is no mention whatever



of the transaction in this statement except in the listing of the bonds and their interest among the company's liabilities for the present fiscal year.

There is, of course, no reference to the change of the control of the property which after having been held by banking interests in Wall street for a time will be turned over to the Atlantic Coast Line Railroad this month. This change of ownership is not an affair of the company as a corporation, but the issue of the \$5,000,000 additional stock is on a different basis. All that the directors say on this subject, however, is that the stock was "increased during the year to \$60,000,000 by the issue of \$5,000,000 of stock which was authorized by the stockholders on Nov. 8, 1893. This additional stock has been sold by authority of the Board of Directors." Thus there is no explanation of the purposes for which the additional stock was sold or held available, and this has not been elsewhere more formally explained than to say that the new capital was issued to give the Louisville & Nashville control of the Atlanta, Knoxville & Northern Railway. This company's main line from Marietta, Ga., to Knoxville, Tenn., 205 miles, will be used, with a connecting line now building, to give the company a direct line between Atlanta and Cincinnati.

This line was taken over in May, when the additional \$5,000,000 Louisville & Nashville stock was sold, and earlier in that month there had been other changes in Louisville & Nashville's controlled lines, certain of these heretofore leased or otherwise controlled being merged. At the end of the year, therefore, the company owned 5,542 miles of road, including the Nashville, Chattanooga & St. Louis Railway of 942 miles and the entire Georgia Railroad, which is jointly leased with the Atlantic Coast Line, itself now in control of the Louisville & Nashville. This is an increase of 218 miles from June 30, 1901. During the year, however, the Cecilia branch of 46 miles, owned by the Louisville & Nashville, but leased for a number of years past to the Illinois Central, was bought by that company under the terms of the contract. The average line worked during the year, taken into the record of the revenue and traffic statistics, was 3,327 miles, an increase of 157½ miles.

On this mileage the increase in gross earnings is reported as \$2,690,050, with an increase in operating expenses, exclusive of taxes, nearly as large; so that the gain in net operating earnings is reduced to \$20,645. The changes in the items of operating expenses which would explain this heavy increase in operating cost cannot be set forth, because of changes in the last few years in the company's accounting methods. Up to the 1901 fiscal year it had been the custom to credit gross earnings and charge operating expenses with company freight, this item being \$1,193,500 in 1901. Gross revenues and expenses as now reported for the last two fiscal years eliminate this account from the totals of gross earnings and expenses, but as the division of the item among the different accounts of operating expenses is not ascertainable from the published reports, comparisons of the changes in expenses for the two years would be misleading. It is also to be noted that whereas in 1901 the company credited gross receipts with income from rent of equipment, this item, which amounted to \$180,755 in 1902, is credited for that year directly to net income; so that the gross receipts and net earnings as shown in the income account below would be larger by this item of \$180,755 than actually appears in the figures if the company had made up its accounts in the two years on the same basis.

	1902.	1901.	Increase.
Freight earnings.....	\$22,772,176	\$20,419,162	\$2,353,014
Passenger earnings.....	6,217,803	5,742,581	475,222
Gross earnings.....	30,712,257	28,022,207	2,690,050
Operating expenses.....	20,902,438	18,233,033	2,669,405
P. c. expenses to gross	68.06	65.07	2.99
Net earnings.....	\$9,809,819	\$9,789,174	\$20,645
Total net income.....	10,810,841	10,493,862	316,979
Fixed chrgs., taxes, etc.	6,085,534	6,212,748	*127,214
Income over charges	\$4,725,307	\$4,281,114	\$444,193
Dividends (5 per cent.)	2,875,000	2,695,000	180,000
Surplus.....	\$1,850,307	\$1,586,114	\$264,193

\*Decrease.

The dividend rate is unchanged, but the last semi-annual payment in 1902 was on the increased stock of \$60,000,000 as against \$55,000,000 formerly outstanding. The decrease in the interest charges is due to the refunding and the property is likely to profit further from these operations in the present and later years.

Maintenance of way charges account for \$4,535,930, or about 15 per cent. of gross earnings, and maintenance of equipment charges amounted to \$4,440,251, or about 14½ per cent.; so that the company expended something under 30 per cent. of its gross receipts for the maintenance of the property. Of the total maintenance charges of \$8,976,200, the report states that \$1,487,277 was for improvement work, this item comparing with \$1,474,500 expended on betterment account in the previous year. This separation of the maintenance accounts is made by the directors to give some idea of the income being used for betterment purposes beyond what is regarded as renewals, the construction account of Louisville & Nashville having been closed in 1894. Of the total improvement charges in 1902, \$440,700 was for equipment and shop machinery, but this seems to have been chiefly for improvement of equipment rather than for additional rolling stock. During the year the company bought 36 new locomotives of which 10 were for replacements, the cost of 28 engines, \$341,810, being charged to equipment reserve fund; and the cost of eight others, \$125,056, being charged to capital account. The company bought and built 2,192 new

freight cars but destroyed 976, and it charged the cost of 1,301 cars, \$934,306, to capital account; and the cost of \$91, \$621,813, to rolling stock reserve fund.

Of the \$1,046,000 improvement charges on tracks and buildings, the cost of sidings, ballasting and buildings accounts for \$515,200. This improvement account is not only interesting as showing the expenditures the company is making in improving its property, but also as indicating the different character of the betterments as compared with those absorbing the larger share of the improvement charges of other companies. Thus for bridges only \$47,900 was spent; for second track less than \$500; and apparently nothing at all for side tracks, although this account amounted to \$256,000 in 1901. There are no charges for water supply; only \$12,500 for new shop machinery, and for grade reduction less than \$25,000 is charged as improvements.

These improvement expenditures charged to operating expenses are for the line owned and directly worked, the betterment work on the various subsidiary properties being apparently capitalized and charged against their accounts, the Louisville's balance sheet showing advances to subsidiary companies amounting to \$2,502,300 on June 30 last as against \$1,543,000 on June 30, 1901. In addition to this increase, the Louisville & Nashville charged to its own capital account about \$360,000 for improvements and construction on various subsidiary lines irrespective of the cost of 109 miles embraced in four subsidiary companies taken over and merged into the Louisville & Nashville's account in the year, the capital account being increased \$1,301,000 in this operation.

The inclusion of these and other acquired properties in the traffic receipts accounts for perhaps half of the growth in gross receipts. On the average miles worked, however, there was an increase of \$390 per mile of road in gross receipts, equal to an aggregate of \$1,300,000 for the whole line operated, as against \$2,690,000 reported aggregate gains. Per mile of road the company's gross receipts were \$9,232, as against \$8,842 in the previous year, and net operating earnings were \$2,949, as against \$3,089 in the previous year. Increase in freight receipts amounted to 11½ per cent. in the year as against an increase of 7 per cent. in passenger train receipts. In both classes of traffic, however, there was a decrease in the average rate received, so that the gains in revenues shown resulted from relatively heavier increases in movement, nearly 10 per cent. in number of passenger-miles and over 15½ per cent. in number of ton-miles. The principal changes in traffic statistics are shown below:

	1902.	1901.	Increase.	P. c.
Aver. miles worked.....	3,327	3,169	158	4.97
Pass. train miles.....	6,042,402	5,825,994	216,408	3.71
Passengers carried.....	7,197,018	6,872,354	324,664	4.72
Passenger-miles.....	263,429,527	239,730,479	23,699,048	9.89
Pass-mile rev. (cts.).....	2.32	2.35	*0.03	1.28
Passenger journey.....	36.6	34.9	1.7	4.9
Freight and mixed train-miles.....	13,307,976	11,954,030	1,353,946	...
Tons moved.....	18,320,972	16,685,466	1,635,506	9.8
Ton-miles.....	3,072,504	2,655,984	416,520	15.7
Loaded freight car-miles.....	186,027,534	169,251,822	16,775,712	9.9
Empty freight car-miles.....	81,306,438	80,038,889	1,267,549	1.58
Freight trainload.....	231	222	9	3.9
Tons per loaded freight car.....	16.52	15.69	0.83	5.3
Ton-mile rev. (mills).....	7.41	7.69	*0.28	3.6
Earnings per freight train-mile.....	\$1.711	\$1.708	.003	...
Aver. freight haul (miles).....	168	159	9	5.7

\*Decrease. †000 omitted.

**Union Pacific.**—The report of this company for the year ended June 30 last covers the operations of a year of large increases in traffic and revenue; the prosecution and partial completion of extraordinary improvement work, and also by considerable readjustments in capital account through the changes in the company's investments by the organization of the Northern Securities Company and the increase in stock holdings in the Southern Pacific Company to a total of \$90,000,000 par value, not far from a majority of that company's total outstanding stock. On all these subjects there is interesting information in the report, though the explanation in the text is not extended. The statistics of the report appear in new and improved form, however, clear in their method of presentation and reasonably complete. No risk is taken in assuming that the responsibility for this latter improvement lies with Mr. William Mahl, now Comptroller of the company as well as of the controlled Southern Pacific, whose work as a railroad accountant is known and appreciated by railroad officers and those whose interest leads them to study railroad statements.

In its revenue statistics for 1902, the Union Pacific makes a striking showing, both in the increase in gross receipts and in the fact that so large a proportion of this increase was saved as additional net revenue. With total transportation receipts of \$47,500,280 from the operation of 5,711 miles of rail line, the increase over 1901 was \$3,962,100, or 9.1 per cent.; while the increase in operating expenses, exclusive of taxes, was only \$852,612, or 3½ per cent., and of this total approximately three-fourths was due to higher maintenance expenditures. The miscellaneous income of the year was extraordinarily increased through receipts of dividends on the company's holdings of stock of the Northern Securities Company, these holdings amounting to \$82,491,871 par value. On the other hand, the company had to pay interest on loans and other open accounts attributable to its purchases of Southern Pacific and Northern Pacific stocks, these charges amounting in the year to \$1,497,100, which is included in the statement of fixed charges. These were swelled in addition by the fact that the company had to

meet a full year's accruing interest on the convertible bonds, of which \$91,950,000 were outstanding on June 30 last, whereas interest on this issue accrued for only a few months in 1901, when they were issued to pay in part for the purchase of the \$75,000,000 Southern Pacific stock then taken over, and also to meet part of the cost price of the Northern Pacific Railroad stocks, also purchased in 1901. Thus, though miscellaneous net income increased by \$3,521,000, the increase in charges—\$4,543,000—offset this gain by over \$1,000,000, leaving the available income for dividends approximately \$2,000,000 above the figure of 1901, as is shown in the comparative income account for the last two years below:

	1902.	1901.	Increase.
Aver. miles operated.....	5,711	5,543	168
Gross earnings.....	\$47,500,280	\$43,538,181	\$3,962,099
Operating expenses.....	24,189,466	23,336,854	852,612
Taxes.....	1,369,761	1,250,291	119,470
Net earnings.....	\$21,941,053	\$18,951,036	\$2,990,017
Total net income.....	26,521,655	20,010,280	6,511,375
Fixed chrgs., taxes, etc.	12,018,406	7,475,222	4,543,184
Net income.....	\$14,503,249	\$12,535,058	\$1,968,191
Dividends (preferred).....	4,205,082	4,000,014	205,068
Dividends (common).....	3,981,532	3,979,580	1,952
Dividends on O. R. & N. shares.....	654	1,376	...
Surplus.....	\$6,315,961	\$4,554,088	\$1,761,873
Betterments.....	2,000,000	1,500,000	...

The appropriation of \$2,000,000 for improvements and betterments out of current income reported for 1902 covers only a small part of the cost of the work of this character carried on during the year. The total capital expenditures for improvements on the Union Pacific Railroad in the year is set down as \$5,306,742, of which \$3,863,600 represents expenditures on roadway and buildings. Of this aggregate cost, \$1,273,000 was met by special funds not representing the proceeds of capital issues, so that with the \$2,000,000 directly appropriated out of the surplus of the year the amount remaining charged to capital account was reduced to \$2,034,000.

The total charge to capital account, exclusive of cost of securities purchased, is \$3,342,200, which includes \$2,034,000 for construction of new lines, less a credit of \$491,000, representing special funds and sales of property. The capital charges of the year do not seem to include certain work on subsidiary properties, the company carrying as a deferred asset \$4,394,000, representing advances for construction of new lines.

The financial changes of the year are difficult to follow. The text of the report does not discuss this question and comparison of the last two annual statements would only show net changes and not the total expenditures. The company seems, for instance, to have provided the funds for the increase of \$15,000,000 par value in its holdings of Southern Pacific stock by appropriation of \$8,900,000 cash received on the sale of its Northern Pacific Railway share holdings to the Northern Securities Company, in addition to the stock of the latter corporation turned over to the Union Pacific. A heavy floating debt shown in the 1901 account, representing the unfunded balance of indebtedness in the purchase of the Northern Pacific Railway stocks, still appears in the report for 1902, the loans and bills payable being reported as \$28,750,000, or something less than in the previous year. This item, however, has been liquidated since the close of the fiscal year by the proceeds of the sale of \$31,000,000 4 per cent. bonds of the Oregon Short Line Railway and from other assets. Exclusive of this issue of \$31,000,000, the outstanding capital on June 30 last aggregated \$451,753,000. This great sum included \$248,098,000 bonded debt in the hands of the public; \$99,531,900 preferred stock, and \$104,057,900 common stock, besides about \$65,000 unexchanged securities of Union Pacific auxiliary companies, the Oregon Short Line and Oregon Railway & Navigation Co.

This capital controlled a system operating on June 30 5,930 miles of main line and 1,035 miles of water lines, with 76½ miles of second track and 1,404 miles of sidings, besides the stock interest in the Southern Pacific, the Northern Securities Company, and an interest of \$5,000,000 in the capital stock of the Occidental & Oriental Steamship Company, operating on the Pacific Coast, and other interests.

Operating statistics of the report are based on an average of 5,711 miles and the changes in earnings and expenses on this mileage are shown in the table below:

	1902.	1901.	Increase.
Aver. miles, rail lines.....	5,711	5,686	25
Earnings, freight.....	\$33,982,782	\$31,436,360	\$2,546,422
Passenger.....	9,011,251	7,924,690	1,086,561
Tot. earn., rail lines.....	46,639,629	42,780,918	3,858,711
Earnings, water lines.....	860,650	849,347	11,303
Gross earnings.....	47,500,280	43,639,264	3,861,016
Expenses—			
Conduct'g transport'n.....	\$11,686,928	\$11,603,705	\$83,223
Main. way and struct.....	5,947,906	5,429,782	518,124
Maintenance of equip.....	4,568,699	4,471,242	97,457
General expenses.....	1,076,169	1,059,025	17,144
Oper. exp., rail lines.....	\$23,279,702	\$22,563,754	\$715,948
Expenses, water lines.....	909,764	835,294	74,470
Total expenses.....	\$24,189,466	\$23,399,048	\$790,418

The little change in the cost of conducting transportation is attributed in the report, together with other evidences of the gains in the direct working efficiencies of the properties, "to the radical reductions of grade curvature and distance affected by the changes of line which have been made," although the greater capacity of locomotives and cars also contributed to the results. The increase in the cost of conducting transportation is, in fact, less than ¼ of 1 per cent., as compared with an increase of 9 per cent. in gross receipts from the rail lines operated, and there was an increase of 10,224, or over 17 per cent., in the passengers carried one mile per mile of road, and an increase of 79,862, or 11.9 per cent., in ton-



miles per mile of road. The revenue train load is not reported, but the tons per train, including both commercial and company freight, was 418 tons for the system lines, a gain of over 52 tons in the year, the increase on the Union Pacific Railroad proper, where most of the improvement work was carried on, being 56½ tons, to a total of 410½ tons, this being a gain of over 16 per cent. The increase in freight car miles was 22,156,000, or 7½ per cent., while there was an actual decrease of 678,300, or 5.4 per cent., in the miles run by freight locomotives, including light and helping service. The increase in tons per loaded car was from 18.92 tons, in 1901, to 19.49 tons in 1902, these being figures for the system, the gain in load per car on the Union Pacific proper being only .48 ton to a total of 18.81 tons. Certain traffic statistics follow:

	1902.	1901.	Increase.	P. c.
Miles worked.....	5,711	5,686	24.5	.43
Passengers carried.....	3,398,659	3,118,862	279,797	8.97
Pass.-miles per mile of road.....	70,130	59,906	10,224	17.1
Aver. pass. journey.....	118	109	9	7.89
Tons moved.....	8,590,193	8,312,371	277,822	3.34
Ton-miles of rev. & company freight per mile.....	751,097	671,235	79,862	11.9
Loaded freight car-miles.....	220,104,493	201,684,748	18,419,745	9.13
Empty freight car-miles.....	90,093,932	86,357,634	3,736,298	4.33
Freight trainload, all freight.....	418	366	52	14.3
Freight trainload, per traffic mile.....	367	308	59	19.1
Freight carload (tons).....	19.49	18.92	.57	3.01
Earnings per rev. freight train-mile.....	\$3.31	\$3.01	0.30	9.97

As the locomotive mileage is given with unusual fullness, and as the changes in the different divisions bear directly on the economies of operation in the year, these statistics are summarized below:

	1902.	1901.	Decrease.	P. c.
Passenger train-miles.....	8,384,103	8,191,621	*192,482	2.35
Freight train-miles.....	9,817,280	9,968,177	150,897	1.51
Mixed train-miles.....	450,559	470,569	20,010	4.25
Total rev. train-miles.....	18,651,942	18,630,367	*21,575	....
Light and helping pass. train-miles.....	290,785	514,729	223,944	43.5
Light & helping freight train-miles.....	1,406,053	1,934,874	528,821	27.3
Total traffic-miles.....	20,348,780	21,079,970	731,190	2.88
Switching loco-miles.....	3,063,536	3,034,232	29,304	.97
Total loco-miles.....	23,412,316	24,114,202	701,886	2.91

\*Increase

#### NEW PUBLICATIONS.

*Poor's Manual of the Railroads of the United States.*—Thirty-fifth Annual Number, 1902. Octavo, 1,640 pages, maps, indexes. New York: H. V. & H. W. Poor. London: Edinham Wilson. \$10.

A week or two ago we printed some statistics from the new edition of Poor's Manual and now it only remains to announce the appearance of the volume. The figures given are to the ends of the various fiscal years of the several companies during 1901, although some general figures are given to the end of that calendar year. Up to Dec. 31 the length of completed railroad was 198,787 miles, and the line built in the year 1902 already carries the aggregate well over 200,000 miles.

Poor's Manual remains, as it has long been, the most important work of the kind in the world. The yearly statistical volume published by the Interstate Commerce Commission gives general figures of considerable use to students, but the information about individual railroad companies is very little. Poor's Manual, as is well known, gives an abstract of the history, financial situation, results of working, organization, etc., of each railroad in the United States. Within a few years an important addition has been made of like statistics for street railroads, which department now fills 240 pages. Another department deals with miscellaneous industrial corporations, and this fills 110 pages. Still another department has to do with state and municipal debts. Finally, there are tables of dividends paid by the railroad companies and by the street railroad companies, bond lists of leading railroads, lists of dates of annual meetings and transfer agencies, and lists of railroad officers.

#### TRADE CATALOGUES.

*The Kalamazoo Railway Supply Co.*, Kalamazoo, Mich., send a catalogue of lifting jacks and other track appliances. The jacks are designed to fulfill the requirements laid down by the Roadmasters' Association at their last meeting and reported in the *Railroad Gazette* Sept. 19, 1902, page 721.

*Henry Pels & Co.*, New York, have issued a 55 page catalogue entitled "Up-to-Date Punching and Shearing Machines." Machines for cutting, punching and shearing structural shapes are illustrated, and testimonials from prominent users are given. The feature of all their machines is the exclusive use of wrought iron and steel in the construction. The hand power machines are made under the Werner patents and the belt driven machines under the Johns patents.

*Oil for Heating and Kindling* is a pamphlet sent out by the Railway Materials Company, Chicago, which describes and illustrates applications of the Ferguson portable heater and kindler. Engravings show it in use heating bent locomotive frames on the engine in the roundhouse, heating driving-wheel tires, straightening parts of wrecked steel cars, etc. An illustration of the Ferguson

furnace for flue welding, forging, spring tempering and similar smith shop operations is also shown.

*The Rand Drill Co.*, 128 Broadway, New York, and 37 other cities, have issued a small catalogue of their Imperial automatic air compressors. The illustrations are, for the most part, full page engravings and include steam, electric and belt driven compressors. Usual tabulated descriptions accompany the illustrations.

*The Acme Machinery Co.*, Cleveland, Ohio, sends its latest catalogue of bolt cutters, nut tappers, bolt headers, rivet headers and upsetting and forging machines. One of the latter machines was illustrated in the *Railroad Gazette* Aug. 1, 1902. The catalogue contains 140 pages with many good engravings. A number of practical suggestions are given such as how to make, recut and grind dies, what method of lead screw to use in cutting threads of accurate pitches, etc.

*The Mechanical Cashier* is the title of a handsome artistic little pamphlet issued by the American Mechanical Cashier Co., 40 Wall street, New York. The mechanical cashier is a comparatively new machine, and, as its name implies, it receives money, locks it up, records the transaction and the number of the operator, stamps the cash check, totalizes and makes change. The money received from a sale is placed in the proper opening and locked in the machine by pressing a lever. The amount of the purchase is next registered in the usual manner and a sales ticket is slipped into the machine after which the operator turns a handle at the side and the proper amount of change is delivered. In addition, the particulars of the sale are printed on three different parts of the sales ticket and one part is clipped off and deposited in a locked drawer. The sale is also recorded on a record tape and the total sales are registered on dials on the front of the machine. In a "Charge," "C. O. D." or "Exchange" transaction the operator turns a small knob and the proper item is printed on the record tape and sales ticket, but the totalizing dials do not record such a transaction. The mechanical details of the machine are described in the pamphlet. A number of large department stores have tried the machine and have pronounced it satisfactory.

#### Gas Power Development.

The gas engine central station is assuming material form in several recent projects for the utilization of gas fuel for power and lighting purposes. A complete equipment of gas generators, gas engines and direct connected generators is in process of installation in several important American industrial establishments, viz.: The Winchester Repeating Arms Co., New Haven, Conn.; the Atlantic Refining Co., Philadelphia, Pa.; the Consolidated Industries Co., Batavia, N. Y., and the Rockland Electric Co., Hillburn, N. Y. The first of these equipments to be put in operation will be that of the Winchester Repeating Arms Co., at New Haven. The power house has been specially designed for the new gas apparatus and the entire power for manufacturing and lighting purposes will be furnished from this point. The engines are the Westinghouse standard vertical three-cylinder single-acting type, aggregating 500 h.p. each, being direct connected to 250 volt direct current generators. The gas fuel is supplied by Loomis-Pettibone producer gas generators in an adjoining room. Two additional engines of the vertical type are used as auxiliaries. Gas holders are provided to insure continuous and uniform fuel supply.

The power station of the Atlantic Refining Company will be equipped with a new type of Westinghouse gas engine and a type new to American practice, viz.: the horizontal, double crank, double acting engine. There will be two engines, each of 500 h.p., each engine direct connected to a 350 k.w. 25-cycle, 3-phase generator arranged for parallel operation. This feature is of much interest and importance at the present time. A rich oil gas of approximately 1,200 B.t.u. per cu. ft. will be used.

The equipment of the Consolidated Industries Co. is of still greater interest. The plant will supply three products, viz.: metallurgical coke, fuel gas, and electricity. A special process will be used yielding metallurgical coke, and fuel gas as a by-product. The electricity for lighting and power purposes will be generated at a central power station by 250 h.p. Westinghouse gas engines of the new horizontal double acting type direct connected to Westinghouse A. C. generators operating in parallel and supplying current at 1,100 volts to the distributing net work. A smaller generating unit will also be used for light loads.

Another gas power enterprise and one capable of certain ultimate development is the Rockland Electric Co., which together with the Ramapo Iron Works and the Ramapo Foundry Co., constitutes the Snow interests. The installation will consist of an independent gas manufacturing plant using the Loomis-Pettibone process, and a power plant containing Westinghouse direct connected gas engine generator units. The producer plant will supply water gas to the iron plants mentioned above for heating and metallurgical purposes, and electric power to all industrial plants in the vicinity, including the American Brake-Shoe Co. at Mahwah, N. J., about four miles from Hillburn. The plant will also supply current for lighting the Ramapo Valley district 14 miles in extent be-

tween the towns of Ridgewood, N. J., on the south, and Hillburn, N. Y., on the north. The gas engines are also of the new Westinghouse horizontal double-acting type of 350 h.p., each equipment aggregating 1,200 h.p., or 1,400 h.p. maximum. The engines are direct connected to Westinghouse polyphase generators and constructed to operate in parallel. A 128 h.p. vertical gas engine unit will also be employed for carrying light loads, and assisting peak loads. A small amount of direct current power will be furnished for a short time from one of the main units, which will be temporarily a d.c. unit, but it is the intention to ultimately replace this d.c. generator by an a.c. generator, thus converting the entire plant into a polyphase gas engine central station.

The machinery will in all cases be furnished and erected by Westinghouse, Church, Kerr & Co., Engineers, New York.

#### Caisson Sickness.

Those who have charge of constructions at considerable depths under water will do well to consult a work by Doctors Richard Heller, Wilhelm Mager and Hermann von Schrötter on affections due to air pressure, especially the so-called caisson sickness, recently published in Vienna. Aside from its collection of data from experience in all parts of the world, it has special value as recording the scientifically observed and recorded experiences in the construction of the locks for the regulation of the rapids of the Danube, built by the contractor, Carl Redlich. One of the authors of the treatise, Dr. von Schrötter, had medical charge of the force engaged in this work, and subjected the men to careful and uninterrupted observation and study. The contractor contributed to the cost of the publication of the volume, which seems calculated to greatly reduce the fatalities and disabilities which have usually accompanied working at great pressures.

The authors of this work declare that with proper precautions work is practicable without danger in pressures up to five atmospheres. But this is safe only after medical examination of all workmen and with unremitted medical observation, and with provision for gradually reducing pressure on coming into the upper air, and for increasing it at will in case any of the workmen are taken with the symptoms of the caisson disease. At the higher pressures, at least half an hour of gradual reduction is required before the normal atmospheric pressure can be safely endured.

The work also treats of the effect of abnormally light pressures encountered at very high elevations, which is a matter of importance in the construction and the working of many Swiss mountain railroads. It will perhaps surprise most of us to learn that the upper terminus of the proposed Jungfrau Railroad will be a little lower than the actual upper terminus of the Pike's Peak Railroad, which has been worked successfully for many years with no more serious results for passengers or employees, so far as appears, than a certain amount of giddiness on reaching the summit. The foot of this railroad, however, is some 6,500 ft. above the sea, while the foot of the Jungfrau is 4,000 ft. lower.

In view of the several difficult tunnels now projected experience in work at high pressures becomes of special interest in this country, and we venture to give the full title of the work in question.\*

#### TECHNICAL.

##### Manufacturing and Business.

The Central Car Wheel & Castings Co., of Pittsburgh, will change its name to Central Car Wheel Co.

Traveling cranes and hoists are in great demand, according to Pawling & Harnischfeger, of Milwaukee, who report 17 important recent orders.

At the Düsseldorf Exhibition the highest award of merit, the gold medal, was awarded to the Hunt Conveyor, manufactured by the C. W. Hunt Co., West New Brighton, New York.

P. H. Wilhelm, Atlanta, Ga., has included in his list of supplies the Spear & Miller Co.'s "Ideal" brake shoe; also the Spear shoe, and the Chicago Brass & Copper Works' "Ideal" journal bearing.

The Ingersoll-Sergeant Drill Co. will soon let contracts for the equipment of its new plant at Phillipsburg, N. J. The structural work for the building will be supplied by the McClintic-Marshall Construction Co.

The United States Coal Company will equip its soft coal mines at Dillonvale, Jefferson County, Ohio, with electrical machinery which it has bought from the Westinghouse Electric & Mfg. Co., in addition to two 10-ton mining locomotives.

Henry L. Norton, of Springfield, Mass., who has been active in bridge building in New England for a number of years, will establish a plant in Springfield. The plans for this plant are made and the work of building the main structural shop, 40 x 100 ft., is under way. Contracts on hand average 43 bridges.

At the recent Düsseldorf Exhibition Arthur Koppel was awarded the silver medal for his exhibit of industrial rail-

\*Luftdruck-Erkrankungen, mit besonderer Berücksichtigung der sogenannten Caissonkrankheit. Von Dr. Richard Heller, Doctor Wilhelm Mager, und Dr. Hermann von Schrötter. Mit zahlreichen Abbildungen. Wien: A. Holder.



road equipment, dump cars, inclined plane, self-discharging ore cars, electric railroads, etc. This was the highest medal given for this kind of equipment. This firm also received the gold and silver medal at the Paris Exhibition, which was the highest award given there for similar material.

Owing to the rapid increase of the coupler business of the Michigan Malleable Iron Co., Detroit, it has been deemed necessary to separate the coupler and malleable business, and the Monarch Coupler Co. has been organized to handle the Monarch solid and Detroit couplers formerly handled by the Michigan Malleable Iron Co. The officers of the two companies are practically the same, with W. C. McMahon as Manager of the Monarch Coupler Co., Detroit.

Spencer Otis has resigned as Western Representative of the American Locomotive Co., and has been succeeded by J. H. Setchel, who for the past 13 years has been General Traveling Agent, first of the Pittsburgh Locomotive Works and later of the American Locomotive Co. Previous to his connection with the Pittsburgh Works, Mr. Setchel was, for three years and a half, Superintendent of the Brooks Locomotive Works. The western office of the American Locomotive Co. is in the Fisher Building, Chicago.

The Chicago Pneumatic Tool Company report large sales of pneumatic tools within the last week to the following concerns: Union Pacific Railway Company, Newport News Shipbuilding & Dry Dock Co., U. S. Navy Yard, Brooklyn, N. Y.; Maryland Steel Co.; International & Great Northern Railway, Standard Oil Co., American Locomotive Co. (Brooks Works), Baldwin Locomotive Works, Seattle, Tacoma & Interurban Railway; Chicago, Burlington & Quincy Railroad, for their Galesburg, W. Burlington and Aurora shops; J. I. Case Threshing Machine Co.; New York Central & Hudson River Railroad.

The smoke nuisance is receiving much attention from the city authorities of Providence, R. I., and the Rhode Island & Suburban Railway has contracted for a large equipment of Roney Mechanical Stokers for its new boiler plant. The plant will have an ultimate boiler capacity of 8,300 h.p. The Narragansett Electric Lighting Co. is also installing Roney Stokers, comprising 12 stokers of the quadruplex type operating under Babcock & Wilcox boilers of 4,500 h.p. capacity. A third industrial plant employing these stokers is the Brown & Sharpe Mfg. Co., where Roney Stokers under two batteries of Babcock & Wilcox boilers have been in use for some time.

#### Iron and Steel.

Philo H. Skidmore, Jr., proprietor of the Pacific Iron Works, Bridgeport, Conn., died in that city Nov. 8 at the age of 51.

The Pennsylvania R. R. has given a contract to the Pennsylvania Steel Co. for 9,000 tons of bridge and structural work for delivery in 1902.

On Nov. 1 the U. S. Steel Corporation had unfilled orders on hand aggregating 4,968,002 tons, about double the amount of orders on hand Nov. 1, 1901.

The American Steel Foundries Co. has made application to the New York Stock Exchange to list \$15,500,000 6 per cent. preferred, and \$15,000,000 common stock.

Work has been begun on the new stack at the furnaces of the Andover Iron Co. at Phillipsburg, N. J. The property now belongs to Joseph Wharton, of Philadelphia.

The Idoras Steel & Iron Co., with headquarters in Jersey City, has been incorporated in New Jersey, with \$200,000 capital. James Reiley, Wm. Flatherty and T. P. Flatherty.

An inspection of all the plants of the Republic Iron & Steel Co. is about to be made, with a view to providing safety appliances to reduce the number of accidents at the mills and furnaces.

It is reported that Frank J. Hearne, until recently President of the National Tube Co., will become President of the Youngstown Iron, Sheet & Tube Co., to succeed Geo. D. Wick, who retired some months ago.

The Monongahela steel works department of the National Tube Works Co. at McKeesport, last month broke all previous records for output. The finished output was so great that when the plant reached the last few hours of the month, it was necessary to suspend operations as the stock yards where the raw material is stored were in some parts empty. The railroads were unable to deliver ore and coke fast enough. A little over 30,000 tons of metal were turned out at the plant last month, 5,000 tons above the best previous record. Thomas Edwards is the Superintendent.

#### Iron and Steel Prices.

A little comparison with the highest level of prices in the fall of 1899 shows how comparatively low present prices are. In September and October of that year the following high levels were reached: Bessemer pig iron, \$25, valley; steel billets, Pittsburgh, \$40 to \$44; tank plate, 3 cents to 3.25 cents; No. 28 gage sheets, 3.25 cents to 3.35 cents; tinplates, \$4.65. Against these we have the Steel Corporation with 200,000 tons of Bessemer pig still coming to it at \$16.50, valley, and the current market, \$21.50 to \$23; billets at \$30, plates at 1.60 cent, sheets at 2.75 cents, and tinplates at \$4.—*Tin & Terne.*

#### New Office Building for Chicago Roads.

The Standard Office Company of Chicago has been formed for the purpose of building a large office building

in that city at the corner of Jackson and Michigan boulevards, the reported cost of the structure to be \$2,000,000. The building will be approximately 171 ft. square and probably 17 stories high. The first Board of Directors includes the names of President E. P. Ripley, of the Santa Fe, and President A. J. Earling, of the Chicago, Milwaukee & St. Paul. It is said that both of these roads have entered into an agreement for space for general offices, and that the Chicago & Alton will also become a tenant. The general offices of the latter are at present in the Monadnock Building, and they have just leased for one year from May 1, 1903, the offices in the Grand Central Station at present occupied by the Rock Island. It is expected that the Standard building will be completed by May 1, 1904. The present lease of the Alton expires May 1, 1903, and they were unable to renew it for less than three years. This will account for their temporary change of location. The railroads will, of course, not be the only tenants of the new building.

#### Terminal to Relieve Chicago Union Loop.

To relieve the congestion on the Chicago elevated loop during certain hours of the day, the stockholders of the Metropolitan West Side Elevated Co. have indorsed the plan of the directors for a down town terminal and spur track. Ground for this terminal was bought several months ago, south of the loop between Market and Franklin streets, and is reported to have cost \$750,000. The spur track will begin at Market street and run easterly into Fifth avenue, thence north to a junction with the loop at Fifth avenue and Van Buren street. Work is to begin immediately after the first of the year.

#### West Milwaukee Shops—C., M. & St. P.

On a tract of land 2,100 ft. long and 1,700 ft. wide in West Milwaukee, Wis., the Chicago, Milwaukee & St. Paul is making some large additions to its shops. To get this site it has been necessary to divert the Menomonee River, making available 30 additional acres of land. On this reclaimed ground the freight car repairing department will be located, and on the ground formerly used by that department a 150 ft. extension to the locomotive shop will be built; a 500 ft. extension to the tank, boiler and tin shop, and the remainder will be used for trackage. By lengthening these various shops 150 ft., the structures will measure 570 ft. This work also necessitated removing two ice houses and several storage sheds. When these improvements have been finished, the capacity of the locomotive department will be 15 locomotives a month, not counting the repair work. A semi-circular addition has been built to the roundhouse, and half of the 44 stalls have been lengthened 25 ft. Two new automatic sanding towers have been built and a large power house is contemplated. It is said that it is proposed to operate as much of the machinery as possible by electricity.

#### Illinois Coals.

The Bureau of Labor Statistics of Illinois has published a bulletin upon chemical analysis and heating values of Illinois coals made by Prof. S. W. Parr and F. C. Koch, of the University of Illinois. The report is a summary of more than 200 analyses, nearly all made at the University and in response to constant inquiries for information.

#### Solid Steel Wheels.

The Standard Steel Works, at Lewistown, Pa., is putting in machinery to make solid steel car wheels. It is well-known that this company has long made steel tired wheels of several kinds; that is, with centers of wrought iron, cast steel and cast iron. It is believed that there will soon be a large demand for a solid steel wheel, to be sold at such a price that it can be used under freight cars, and this belief has led to the installation of the machinery for the manufacture of such wheels.

#### The Havana Floating Dock.

The steel floating dry dock which was bought from Spain and recently collapsed while being docked at Havana, has been cut in two sections and was started from Havana on Nov. 6 to be towed to Pensacola, Fla., for repairs.

#### Pneumatic Tube Service in Boston.

Under the contract recently let to it by the Post Office Department the Boston Pneumatic Transit Company will operate an 8-in. tube between the general post office and the North postal station in Boston, a similar tube to the South Terminal and another from the South Terminal to Essex station, a total of 2.07 miles, the company to be paid for the service \$33,120 a year, or pro rata from the time the tube is put in service until 1906. A 10-in. tube will run from Essex to Back Bay, from Essex to Station A and from Essex to Roxbury, a total of 3.39 miles, for which the company will be paid \$32,860 a year from the beginning of service until 1906.

#### The New Armored Cruisers.

The designs for the two armored cruisers "Washington" and "Tennessee," which are to be built by contract, the bids to be opened Jan. 6 next, have now been completed. The ships will be 502 ft. long, 72 ft. 10½ in. beam, and with a maximum displacement of 15,950 tons and a mean draft of 27 ft. at maximum load. The maximum speed will be not less than 22 knots an hour with 23,000 estimated i.h.p., and a total bunker capacity of 2,000 tons of coal, giving a steaming radius of about 6,500 knots. The hulls will be of steel with double bottoms, the inner

bottom to extend from the keel to the protective deck. As compared with armored cruisers of the "Maryland" class now building there is increased armor and greater protection to gun positions, and the battery has been increased by substituting four 10-in. guns in place of four 8-in. guns in the "Maryland" class, making the "Tennessee" and "Washington" excel in battery power and protection any armored cruisers built, building or designed by any country, and equal to a majority of the battleships, but with four knots more speed than battleships of the "Connecticut" class. The new cruisers will be lighted by electricity, each ship to have six 100 k.w. generating sets of 125 volts. The masts will be fitted for wireless telegraphy. (Nov. 7, p. 860.)

#### De Glehn-Du Bousquet Atlantics in Belgium.

The State Railroads of Belgium are making some tests with the De Glehn compounds and have borrowed from the Nord of France one of their Atlantic type engines designed by M. du Bousquet with this system of compounding.

#### Experiments With Electric Traction in Vienna.

The Vienna City Railroad offers great difficulties in its alignment and grades, and for some time the Austrian Railroad Department and the Siemens & Halske Co. have been conducting experiments with a view to replacing the steam power with electricity. The *Organ* recently printed a statement made by the Railroad Minister of Austria. It is essentially as follows: The trial trains which are being run have so far shown good results. The trains, two in number, consist each of four motor cars and one trailer. The third-rail is used for transmitting the current and is placed between track rails. Each car has an individual contact with the rail. A new form of controller is used, so designed that the motorman operates an auxiliary switch which in turn operates the main switch. Such an arrangement removes many of the difficulties incident to the handling of heavy currents. The great increase in economy which was expected by the introduction of electric power has not so far been realized. Careful records show that the cost of electric traction is about the same as that for steam.

#### Electric Train Lighting and Headlights.

The New York Electric Headlight & Train Lighting Co. has opened an office in the Monadnock Block, Chicago, L. F. Mahler being District Manager. This company controls the De Laval system for locomotive headlight and train lighting equipment, the train lighting system being of the kind where the generating unit is placed in the baggage car. Mr. Mahler is also District Manager for the Curtiss-Crippen Engineering Co., who are exclusive selling agents for the De Laval Steam Turbine Co. for certain of the central and western States, and who will attend to the power, lighting and pumping installations of De Laval apparatus. Turbines of the De Laval type are made in any sizes from 1 h.p. up, in which respect they are distinctive. Also the small turbine sets as well as the large ones show remarkable economy, and it is expected that this feature alone will make them especially desirable in headlight and train lighting service. Freedom from vibration is another advantage claimed in connection with the latter service. The De Laval Company has recently completed large works at Trenton, N. J., and a large number of orders have already been booked in anticipation of the starting of the plant.

#### The Maintenance-of-Way Association.

The Committee on Buildings of the American Railway Engineering and Maintenance-of-Way Association issues the following circular asking for:

1. Copies of printed forms of General Contracts applicable to Building Construction.
2. Copies of printed General Specifications applicable to buildings.
3. Copies of printed forms of Special Specifications for Particular Trades, such as mason work, carpenter work, painting, glazing, roofing, sheet metal work, etc., or a brief description of the practice in vogue.
4. Plans of typical or standard Passenger Stations, such as are used at places with a population of 10,000 to 15,000, stations where a "through" and not a "terminal" station would be in use. These plans need not necessarily be in detail, but should include, if possible, a floor plan, a cross-section, and front elevation, so as to give a general idea of the conveniences provided for and the arrangement of the same. Send replies to the Secretary of the Association, 1562 Monadnock Block, Chicago.

#### Moving a Highway Bridge in Munich.

A new masonry bridge has recently been built in Munich, Bavaria, to replace an old wooden structure. The old structure had 10 spans and weighed 1,325 tons. A single-track electric road crossed the bridge and it was desired to carry on the new construction work without interfering with the traffic. With that purpose in view it was decided to move the old bridge up stream a distance of 82 ft. and establish traffic over it while the new bridge was being built. Piles were first driven in the prolongation of the piers up stream, and on these piles were laid heavy timbers to act as sliding ways. The floor system was next lifted up by jacks and two heavy channel rails were laid on each bearing beam, with the flanges turned towards each other. In the channel way so formed steel spheres were placed for rollers. During this preliminary work the traffic was uninterrupted. Eleven capstans were placed on the bridge and were connected with ropes



for moving. The first attempt was a failure on account of the steel spheres pressing through the channel rails. This was remedied by lining the bearing surfaces of the channels with hard steel plates. The sliding ways were slightly inclined and this assisted greatly in rapidly moving the bridge. After being brought to its new position the floor system was leveled by means of wedges. The time consumed in the entire operation was less than 24 hours, and the actual time required in moving the bridge did not exceed two hours.

#### Steel Corporation Decision.

At Newark, N. J., on Nov. 7 Vice-Chancellor Emery signed a formal decree granting the preliminary injunction against the United States Steel Corporation's \$200,000,000 bond conversion plan, which the Vice-Chancellor allowed the week previous in the suit of J. Aspinwall Hodge and others. Immediately upon the execution of the decree Richard V. Lindabury, for the steel corporation, served notice of appeal upon Robert H. McCarter, representing the complainants, and a messenger was despatched to Trenton to place the papers on file. By agreement of counsel the matter will be argued before the Appellate Court at the term which opens Nov. 18.

#### Locomotives for India.

In a recent issue *The Engineer* (London) has something to say about the orders for locomotives for India which were placed with continental firms last year. In September, 1901, the East Indian Railway Company ordered 40 locomotives from Hanover, the last of them to be delivered August, 1902. A year ago the Assam-Bengal Company ordered 10 engines, which were to have been delivered in April of this year. In April, 1901, the Bombay & Baroda Company ordered 22 engines from Borsig, to be delivered in 42 weeks. The Chairman of the East Indian Company said that he had saved 39 weeks in time of delivery by going to Germany. *The Engineer* says that "up to the end of last week not a single locomotive had been delivered to the East Indian Company or the Assam-Bengal Company." The time of delivery of the Borsig engines had not yet expired. It is said that in these orders as many as 80 cylinder castings have been rejected. The inference of the editor is that with the same conditions there cannot be any important difference in the time required to build a locomotive. On the other hand, the East Indian Company ordered from Dübs & Company 42 engines, delivery to begin last February and to be completed by Sept. 1. The first certificate for a finished engine was given in March and the last in September. Some of the intermediate certificates were dated from one to three weeks before the contract time. A Norwegian iron ore company ordered two locomotives in a great hurry from Kerr, Stuart & Company, of Stoke-on-Trent, on July 12, the first one to be tested under steam Sept. 26. It was tested in steam Sept. 15 and the second one Sept. 18, the last engine being complete at that date. When the order was taken there was nothing in stock that was to be used in these engines, and there was not a single drawing made. "It will be understood that there was no vexatious inspection. Trust was imposed in the reputation of the builders and they, in turn, believed that when they paid a proper price to first class steel makers, they would receive materials of sufficient excellence."

#### Iron and Steel Exports.

During the nine months ending with September, 1902, there were exported from the United States 276 locomotives, against 350 for the nine-months of the previous year. During the same period of 1902 there were exported 65,307 tons of iron ore, against 49,401 for the first nine months of 1901. There was a large decrease in the exports of rails, the total for the nine months of 1902 being 43,071, and that of 1901 266,723 tons. There was an increase of about 5,000 tons in structural iron and steel, and an increase of about 11,000 tons in wire. The total value of all exports of iron and steel in the first nine months of the calendar year amounted to \$73,351,735, against \$76,846,899 in the corresponding months of 1901.

#### Ship Building School at Bath.

The Bath Iron Works, Bath, Me., in view of the scarcity of skilled mechanics in the metal ship building trades, has decided to open a technical school in that city. The company will pay the most of the expenses and award prizes for the best work.

#### New Mills for Pittsburgh District.

Improvements and enlargements to be made by the Carnegie Steel Co. during the next year will cost several million dollars. At Homestead and vicinity the company is planning to build a new open-hearth plant which will add to its capacity of open-hearth steel at the rate of 800 tons a day. The new plant will consist of 16 open-hearth furnaces of uniform capacity. In addition to this, the company will build a new sheared plate mill, universal mill for plate production and another large angle mill which will materially assist in reducing the structural steel scarcity. Although no official announcement has been made in regard to these improvements, it is understood that the engineers are well advanced with the plans.

The National Steel Co. of the U. S. Steel Corporation is having plans made for a new tube works to be built at Lorain, Ohio, and it is said that plans are so far advanced that estimates will soon be asked. The funds for these improvements were originally to be provided

by the extra bond issue which has been delayed by the recent suits in the court, but it is now said that ample money to carry on the work is available without the bond issue.

#### Wabash Bridge at Pittsburgh.

The stone work on the bridge over the Monongahela River for the Wabash R. R. entrance into Pittsburgh is about completed. According to information given out by J. W. Patterson, Chief Engineer of the Pittsburgh, Carnegie & Western, which is building this section of the road, the American Bridge Co. will very shortly begin the erection of the steel work which is now being delivered.

#### New Plant for the Chicago Railway Equipment Co.

The Chicago Railway Equipment Co. has recently bought a large tract of land located in Delray at Detroit, Mich., and has already under construction a branch works which it is expected will be finished before Jan. 1. Only a part of the tract will be built upon at present. The ground fronts 1,200 ft. along what is known as the "joint track" over which all the railroads in Detroit operate. The company states that in the near future it may also extend its line of manufacture. In addition to the main works at Chicago, and the works now being built at Detroit, there is a branch at Jersey City.

#### Pressed Steel Car Output.

All records for turning out cars were broken by the Pressed Steel Car Co. during October, when 3,000 cars were built, the average for the 27 working days being 111 cars. The daily average for the past four months has been 107 cars. Thus far this year, the company has made 22,402 cars. This has required 350,000 tons of steel. In addition, the company has turned out many thousands of underframes for wooden cars, steel trucks, bolsters and miscellaneous car parts. Most of the cars made last month were for the Pennsylvania R. R. The company is having a new plant built at McKees Rocks, and when finished it will make the car trucks formerly turned out at the Fox plant at Lawrenceville.

#### Ships for the Steel Corporation.

The United States Steel Corporation proposes to build a large addition to its fleet of ore ships. Realizing the fact that the berths of the American Shipbuilding Company were all filled and were liable to be kept so, the Steel Corporation, acting through the Pittsburgh Steamship Company, has secured an option on all berths to be vacated during the year 1903 at Buffalo, Cleveland, Detroit, Lorain, Chicago or Superior. Boats now under contract or building will keep the berths at all these lake yards full until the early part of 1903. Just how many of the berths to be vacated can be occupied by ships of the type proposed is a question. This option is at present merely indicative of the proposed work of the corporation, and no plans have been actually decided upon as to the class of ships or as to how many of them are to be laid down under it. The Duluth office has, however, been at work making plans of ships of various types and the probability is that the new vessels will be about 550 ft. over all and will each have capacity on present draft for some 9,000 gross tons of cargo. The present intention is that some 20 such ships will be built, all steamships, and it is likely that a few of them will be in commission late the coming season. They will cost not far from \$500,000 each.—*The Iron Age*.

#### THE SCRAP HEAP.

##### Notes.

The Committee of the Board of Trade of Louisville, Ky., has voted not to encourage Mr. E. P. Bacon in his efforts to have the Interstate Commerce Law amended so as to give more authority to the Commission.

The Railroad Commissioners of Massachusetts are visiting Cleveland, Chicago, St. Louis and other western cities to investigate the practice of the railroads at the several cities in dealing with suburban passenger service; also to look into street railroad equipment and electric motive power generally.

The Interstate Commerce Commission has received a formal complaint from W. R. Hearst, of New York, charging that the railroads carrying anthracite coal to the eastern States exact unreasonably high prices; and the Commission has notified the railroads to make answer to the charges by Nov. 20. It is also alleged that the six principal anthracite carriers have entered into a freight pooling agreement.

While in Chicago last week to hold hearings on live stock rates, Chairman Martin A. Knapp, of the Interstate Commerce Commission, said to a reporter: "The Commission has found the rate situation better in the last few months than it ever has been since the passage of the Interstate Commerce act. In my judgment, injunctions issued by the United States courts restraining cut rates and preferences have been effectual and have proved a splendid thing for both the railroads and the shippers. The Commission, therefore, would like to see them made perpetual, for we are of the opinion that they have resulted in causing traffic all over the country to be carried on the published tariffs. They have made actual and published tariffs synonymous."

#### The Partial Creosoting of Timber in Holland.

The following process for partially creosoting timber is described by the Dutch engineer, J. A. Vander Kloess. The purpose of the process is to only treat that portion

of the timber which is exposed to damaging influences. The ends of the sticks are introduced through a steam tight opening into a tank. The creosote is then pumped into the tank and the fluid forced into the timber, driving out the air and water in the wood. This is quite thoroughly done, since the fluid encounters no resistance but the pressure of the atmosphere. Inspection of a piece of pine timber so treated showed it to be uniformly saturated to a depth of from  $\frac{3}{4}$  in. to  $1\frac{1}{2}$  in. This saturation is equivalent to  $1\frac{1}{2}$  gallons per cu. ft. It is claimed that fir piles can be made to absorb three gallons per cu. ft. Creosoting by this process can be done quicker and cheaper than by usual methods since only that portion of the pile is treated which is driven into the soil.

#### The Traffic of the Central London Railway.

The Central London (tube) earned per week in the year 1901 an average of £6,394. For the first half year it earned an average per week of £7,120. At this rate the earnings per year would be about \$1,800,000. This is on 6.5 miles worked, giving yearly gross earnings per mile worked of \$276,000. The Manhattan Railway, of New York City, earns gross \$296,300 per mile worked.

#### Through the Canals at Sault Ste. Marie—October.

Eastbound.—Articles: Copper, net tons, 11,996; grain, bushels, 8,425,143; flour, barrels, 1,298,751; iron ore, net tons, 2,988,229; lumber, M. ft. B.M., 121,541; wheat, bushels, 14,971,318; general merchandise, net tons, 20,157; passengers, number, 2,192.

Westbound.—Coal, hard, net tons, 10,420; coal, soft, net tons, 449,059; manufactured iron, net tons, 33,615; salt, barrels, 56,180; general merchandise, net tons, 87,753; passengers, number, 1,536. Freight: Eastbound, net tons, 4,028,083; westbound, net tons, 590,208; total freight, net tons, 4,618,291; vessel passages, number, 2,837; registered tonnage, net tons, 4,281,197.

#### Punctuality on the Great Eastern of England.

Our special correspondent has obtained the following figures of relative punctuality on the Great Eastern Railway of England from the General Manager, Mr. G. F. S. Gooday. In July, 1902, out of 62,568 trains that entered the London terminus at Liverpool street 42,602, or 68.09 per cent. arrived on time absolutely; the year before only 60.38 per cent. so arrived. Of the remainder only 1.17 per cent. were more than 10 minutes late. There is a separate return for the morning business trains, and of them 81.07 per cent. arrived on time, while the year before it was 68.88 per cent. A comparison can be made by the table of arrivals for 1890, 1901 and 1902 for the entire number of trains that entered Liverpool street during July in the respective years.

	Number of trains.	On time 1, 2 or 3 min. late.	More than 3 min. late.
		Per cent.	Per cent.
1902.....	12,261	91.51	8.99
1901.....	12,062	85.06	14.94
1890.....	9,113	74.32	25.68

It ought to be further remembered that the summer months are on this line the hardest to work to time owing to the additional seaside expresses and other trains conveying holiday makers.

#### Change of Ownership of The Engineering Record.

On Saturday of this week *The Engineering Record* will announce over the signature of Mr. Henry C. Meyer that he has sold the *Record* to Mr. James H. McGraw. The *Engineering Record* will have been published just 25 years the first of next December. It was started as a monthly under the title of *Sanitary Engineering*. It was shortly changed to a semi-monthly, and about 20 years ago it was changed to a weekly. Twelve or 15 years ago its name was changed, because of the gradual growth of the field covered. Those who are competent to judge, by knowledge of the work done and the field covered, and by years of observation, know better than we can tell what have been the distinguishing characteristics of this journal under Mr. Meyer's ownership and actual control. It has always been clean, honorable and generous in theory and in conduct. Much practical sagacity has been displayed in working carefully and thoroughly along certain valuable and special lines; as for instance, sanitary engineering, methods of construction of bridges and buildings and the engineering of power plants and industrial establishments. Mr. McGraw controls the *Street Railway Journal*, the *Electrical World and Engineer*, and the *American Electrician*, and he believes that the close alliance with those papers of another one devoted to civil and industrial engineering will be of advantage to the readers and advertisers of all of the group of publications. The staff of the *Record* will remain practically unchanged, except that Mr. Henry C. Meyer himself will no longer be connected with it except as an adviser.

#### The Adventures of a Superheated Steam Locomotive.

On Oct. 1 several high officers of the Prussian State Railroads took part in a trial trip of one of the new locomotives using superheated steam, near Berlin. The engine had to slow down before a station, when from some cause the fire-door sprung open as if by an explosion within, and a sheet of flame issued which enveloped the whole foot-board. It struck first the fireman and set his clothes on fire, and he was fatally burned; Cordes, head inspector of the Grunewald shops, jumped, and had his right hand crushed by a passing freight train, so that it was necessary to amputate his forearm. Garbe, a member of the Berlin State Railroad Directory, had one side of his face burned, but was not seriously injured. We may expect a thorough investigation into the causes of this accident and a determination whether it was in any way due to the high pressure of the steam used.

#### Oil Fuel.

A Chicago official of the Atchison road writes with reference to the economies that have been made during the past year by the use of oil as fuel in its locomotives: "On our Gulf Division alone the saving being made is at the rate of about \$300,000 per annum, and with the steady increase in the number of locomotives equipped for oil burning, we expect during the coming year to secure an economy on this division alone of over \$500,000. For our California lines we have a long time contract for crude oil with the Kern River companies at a price considerably below that now quoted for oil. Besides this the development of our own oil property is progressing satisfactorily and our savings on the coast lines will be as much or more than that on the Gulf Division. The service that has been secured by the use of oil has for the most part greatly exceeded our expectations, and it would not surprise me if oil ultimately became the fuel of the entire system."

It is reported that the Southern Pacific Co. has ex-



pended \$5,000,000 for the purchase of oil lands, tanks, and for the conversion of 500 of its locomotives into oil burners, and it is estimated that the saving in fuel expenses for the company will be at the rate of \$150,000 per month or \$1,800,000 annually. The saving on every 100 miles run by using oil is estimated to range from \$16 to \$20.—*Wall Street Journal*.

#### A Noisy Elevated Railroad.

A recently built railroad in Berlin, known as the "Elevated and Underground Railroad," being partly one thing and partly the other, was found to be unpleasantly noisy on its elevated sections (like some other elevated railroads that might be mentioned). The authorities required that on part of the line a sheet of felt should be laid between the rails and the ties. This was done, but it had very little effect on the noise. Another palliative is sought by covered iron troughs filled with sand taking the place of wooden ties. Experiments on a small scale had led to the conclusion that these were worth trying. Longitudinal wooden sleepers in place of cross-ties are proposed; also the plating of the foot of the rails with lead and lead plates between the rails and ties. Another remedy is the sheathing of the wheels with wood.

#### Torpedo Boat.

The torpedo boat destroyer "Whipple," built by the Maryland Steel Co., and now at the Navy Yard, Norfolk, Va., has been provisionally accepted by the Secretary of the Navy.

#### Swedish Roads.

Press despatches state that the Swedish Government will convert the 4,200 miles of railroads in Sweden which are owned by the Government into an electric traction system. The idea of the change is to utilize the great natural water power which the country affords.

#### Chicago Traction Employees Have Wages Advanced.

The employees of the Union Traction and Consolidated Traction street railroad companies of Chicago have won a 10 per cent. increase in wages, dating from Sept. 15. The differences were settled by arbitration. The matter has been pending since last May, at which time the original demands of the men were rejected. The contending parties finally agreed to submit the proposition to a board of arbitration, the result being as above mentioned. The number of employees affected is 3,400.

#### New Railroads Through the Austrian Alps.

About a year ago the first steps for the construction of the new railroads through the Austrian Alps were taken. Since then the work has progressed rapidly, and a recent issue of the *Austrian Weekly of Public Works* gives the progress made up to August last. Four tunnels are to be built. The first one started was the Wocheiner tunnel. About 3,800 ft. of heading had been completed on the north end of this tunnel, 1,540 ft. lined, and 1,810 ft. excavated. On the south end about 2,660 ft. of heading was completed and excavation and masonry work was in full swing. In the Karawanken tunnel about 2,000 ft. of heading was driven on the north end and about 2,500 ft. on the south end and excavation and masonry work was in progress. Preliminary headings have been driven in the Tarnen tunnel about 2,060 ft., and in the Bosruck tunnel 3,830 ft. The Bosruck tunnel will be 15,600 ft. long and will have a single track. It is to be completed in 1905. The geological formation consists mainly of slate, above which is a chalk deposit. Both substances make construction work comparatively easy. It is desired to have the open track work completed by the time the tunnels are ready for traffic.

#### British Iron and Steel Statistics.

The British Iron Trade Association has collected and published the statistics of the production of pig iron, Bessemer steel, and open-hearth steel in Great Britain in the first half of 1902.

The production of pig iron in the first half of 1902 amounted to 4,096,478 tons, against 3,884,544 tons for the first half of the previous year and 4,540,403 tons for the first half of 1900. The situation for the first half of the current year has, therefore, been a substantial improvement on that of 1901, although far from equaling the much more prosperous conditions of the year 1900.

The production of Bessemer steel ingots in the first half of 1902 amounted to 888,378 tons, which is an increase of 96,453 tons on the output of ingots for the first half of the previous year. The quantity of basic Bessemer steel produced in the first half of 1902 was 324,902 tons, while the output of steel by the acid Bessemer process was 563,476 tons. These figures show a surprising increase in the production of basic Bessemer steel.

The production of open-hearth steel in the first half of 1902 was 1,771,038 tons, which is an increase of 140,080 tons on the output for the corresponding period of 1901, and is the largest output recorded for any six months in the history of the open-hearth steel industry. An increase appears in the output of both acid and basic open-hearth steel ingots in 1902. The production of acid steel was 1,529,963 tons, against 1,473,996 tons in the first half of 1901, and the production of basic steel was 241,075 tons, against 156,962 tons in the first half of 1901.—*The Bulletin*.

#### London to Brighton by Gas.

The prospectus of the Brighton Electric Railway (Preliminary) Syndicate, which has just been issued, is a document doing credit to the imagination of its compilers. There is an exuberance of faith about the suggestion that a proposed electric line between a terminus near Waterloo and Brighton could be constructed and equipped for £9,000,000, and leave a substantial profit over for the syndicate. Such details as crossing the existing lines do not appear to have been considered. How net earnings of £698,600 are to be realized at fares of 5s. first class and 3s. 6d. third class we are not informed. To do this would probably require some 3,000,000 passengers a year, and the London, Brighton & South Coast Railway only carries about 750,000 passengers a year now between London and Brighton, a large proportion of whom are carried at excursion rates, at least as moderate as 3s. 6d. If the syndicate is going on with the scheme, perhaps it will issue another pamphlet as illuminating and entertaining as the one to which I had occasion to refer at the beginning of this year.—*Transport*.

#### From Cape Town to Beira.

The railroad between Bulawayo and Salisbury, via Gwelo, 300 miles, was finished Oct. 6, and this link estab-

lished through rail communication between Cape Town and Beira. Of this total distance of 2,000 miles, nearly 1,500 have been constructed through the instrumentality of the Chartered Company. The line is also laid for a distance of 80 miles north of Bulawayo in the direction of the Victoria Falls. It is expected that the line will reach the Wankie coal fields early next year.

#### The Signal Service of the Army.

The annual report of Brig. Gen. A. W. Greely, Chief Signal Officer U. S. Army, says that the telegraph and cable lines in the Philippine Islands which were largely constructed under Col. Allen were increased during the fiscal year by 2,600 miles, and on June 30, 1902, contained 31 submarine cables, 1,326 miles long, and 5,108 miles of land lines, or 6,434 miles in all. The extension of military telegraph and cable lines in Alaska in co-operation with Canada is described at length, the completion of the Canadian line between Dawson and Ashcroft bringing the upper Yukon region of the United States in direct communication with Washington. The satisfactory working of wireless telegraphy in New York harbor a distance of 10 miles, and in San Francisco harbor is noted, the latter holding what is believed to be the longest record of satisfactory working between any stations and being done entirely by enlisted men of the Signal Corps.

#### LOCOMOTIVE BUILDING.

The Chicago Belt has ordered 12 simple locomotives from the American Locomotive Co.

The Fort Worth & Denver City is having two locomotives built at the Schenectady Works of the American Locomotive Co.

The Canadian Pacific, according to press reports, has ordered 20 freight locomotives from the Miller Locomotive Co. of Glasgow, Scotland.

The Evansville & Terre Haute has ordered two simple consolidation locomotives from the Baldwin Locomotive Works. These locomotives will have 21 x 28 in. cylinders, 57 in. drivers; working steam pressure of 200 lbs., and tank capacity, 5,000 gallons of water. The special equipment includes: Westinghouse American air-brakes, steel axles, Sansom bell ringers, Tower couplers and Leach sanding devices.

The Minneapolis, St. Paul & Sault Ste. Marie, as reported in our issue of Nov. 7, has ordered 20 locomotives from the American Locomotive Co. divided as follows: Three compound consolidation; three compound mogul; four passenger of a similar type as received from the Baldwin Locomotive Works last April, and the remaining number will probably be of the compound mogul type, but that has not been decided on. The consolidation engines will weigh 177,000 lbs., with 154,000 lbs. on the drivers, and have 22½ and 35 x 30 in. cylinders, 55 in. drivers; straight top radial stay boilers, with a working steam pressure of 210 lbs., and heating surface of 2,633 sq. ft.; 326 charcoal iron tubes, 2 in. in diameter, 14 ft. 6 in. long; fire-box of Otis steel 102 in. long and 65 in. wide; grate area, 46 sq. ft.; tank capacity, 6,000 gallons of water and 10 tons of coal. The compound engines will weigh 135,000 lbs., with 120,000 lbs. on the drivers, and have 21 and 32½ x 26 in. cylinders, 55 in. drivers; extended wagon top radial stay boilers, with a working steam pressure of 190 lbs.; 268 charcoal iron tubes, 2 in. in diameter, 12 ft. 4 in. long; fire-box of Otis steel 90 in. long and 62 in. wide; grate area, 38 sq. ft.; tank capacity, 6,000 gallons of water and 10 tons of coal. The special equipment for both classes will include: Westinghouse air-brakes; Taylor iron axles; Gollmar bell ringers; Keasbey & Mattison magnesia boiler lagging; Corning brake-shoes; Washburn M. C. B. couplers, with Westinghouse friction draft gear on tender; Ohio injectors; Ajax metal journal bearings; Jerome piston and valve rod packings; Crosby safety valves; Leach sanding devices; Chicago "A" triple sight-feed lubricators; Railway Steel Spring Co.'s springs and Utica steam gages. The consolidation engines will have Standard driving wheel tires, 30 in. cast-iron 600 lbs. truck wheel tires, 33 in. cast-iron 650 lbs. tender wheel tires and cast-iron wheel centers. The compound engines will have Midvale driving and truck wheel tires, 33 in. cast iron 700 lb. tender wheel tires and cast steel wheel centers. Other specialties for both classes are: "Common Sense" tender truck bolsters.

#### CAR BUILDING.

The Pullman Co. is building 10 cars for its general service.

The Michigan Central is having 1,000 freights built at Detroit.

The Georgia Southern & Florida is having 300 freights built by the Georgia Car & Mfg. Co.

The Vandalia is in the market for from 200 to 300 cars, the class of car having not yet been decided.

The Cincinnati, Hamilton & Dayton denies having ordered any box cars recently from Barney & Smith.

The Central of New Jersey has ordered 500 steel hopper cars of 100,000 lbs. capacity from the American Car & Foundry Co.

The Pennsylvania has ordered from 1,000 to 1,100 steel hopper cars of 100,000 lbs. capacity from the American Car & Foundry Co.

The Louisville, Henderson & St. Louis is having 50 freights built at the Jeffersonville Works of the American Car & Foundry Co.

The Coal & Coke Co. (West Va.) is having 100 cars built at the South Baltimore Car Works, in addition to the order reported in our issue of Sept. 19.

The New York, Ontario & Western ordered from Harlan & Hollingsworth the six coaches and two parlor cars for which it was reported in the market in our issue of Oct. 3.

The Western Maryland, according to press reports, has ordered 300 steel hoppers of 100,000 lbs. capacity from the Cambria Steel Co. This report has not as yet been verified.

The Central of Georgia writes that it intends to order some coaches, both first and second class, as mentioned in our issue of Oct. 31, but has not yet decided upon the specifications.

The Lake Shore & Michigan Southern has ordered five 60-ft. baggage cars from Barney & Smith. These cars will conform to the latest standards of the road and have their latest standard four-wheel steel frame truck, with 5 x 9 in. journals.

The Erie is building 300 flat cars, of 60,000 lbs. capacity, divided equally between its Buffalo and Kent shops. These cars will weigh 28,000 lbs., and measure 40 ft. long, 9 ft. 2 in. wide and 50¼ in. high from rail to floor, to be built of wood, with wooden underframes.

The Evansville & Terre Haute has ordered 250 coal and 100 flat cars of 80,000 lbs. capacity from the American Car & Foundry Co. for January, 1903, delivery. The special equipment includes: Steel axles, metal bolsters and brake-beams, Tower couplers, Miner draft rigging and McCord journal boxes.

The Boston & Albany order for 25 coaches, reported in our issue of Sept. 19, was placed with the Bradley Car Works for January and February delivery. Special equipment includes Gould couplers, Diamond special brake-beams, Diamond "S" brake-shoes, Westinghouse brakes, Magnus brasses, Gould axles, Forsyth curtain fixtures, Pantasote curtains, Gold heating system, Gould journal boxes and journal box lids, Pintsch light, Standard Coupler Co. platforms, Gould vestibules and Paige wheels.

The American Smelting & Refining Co., as reported in our issue of Oct. 10, has ordered six gondola cars of 60,000 lbs. capacity from the Western Steel Car & Foundry Co. The cars will be 34 ft. long, 8 ft. 10 in. wide and 4 ft. high from side and end boards, to be built of wood, lined with steel plate, and wooden underframes. The special equipment includes: M. C. B. double hammer iron axles, steel bolsters, Player brake-beams, American continuous draft rigging and Soule dust guards.

The Michigan Central has ordered 300 steel hopper and 750 wood gondola cars from the American Car & Foundry Co. The hopper cars will be of 100,000 lbs. capacity, and the gondola cars of 80,000 lbs. capacity. Special equipment includes steel axles, Simplex bolsters, National hollow brake-beams, Westinghouse brakes, Fulton brasses, Westinghouse sessions, Gould and Twin Spring draft rigging, McCord malleable journal boxes, Diamond arch bar trucks, 650-lb. wheels for the gondolas, and 700-lb. wheels for the hopper cars.

The Chicago, Milwaukee & St. Paul, as reported in our issue of Oct. 31, is building 300 ballast cars of 80,000 lbs. capacity, 200 flat and 150 vegetable cars of 60,000 lbs. capacity, all to be built of wood, with wooden underframes. The ballast cars will weigh 32,700 lbs., and measure 40 ft. long, 8 ft. 10 in. wide and 3 ft. high from floor to top sides. The special equipment includes: Iron axles, single plate iron truss bolsters, Congdon brake-shoes, Westinghouse air-brakes, M. C. B. couplers, Haskell & Barker door fastenings and doors, Miner draft rigging, Barber type trucks and C. M. & St. P. wheels. The flat cars will weigh 26,500 lbs., and measure 40 ft. long, 9 ft. 3 in. wide and 4 ft. 1½ in. high from rail to top of floor. The special equipment includes: Iron axles, double plate iron truss bolsters, Congdon brake-shoes, Westinghouse air-brakes, M. C. B. couplers, Hennessey double barrel friction draft rigging and C. M. & St. P. wheels. The vegetable cars will weigh 38,600 lbs., and measure 35 ft. 7½ in. long, 8 ft. 1½ in. wide and 7 ft. 10½ in. high, all inside measurements. The special equipment includes: Iron axles, single plate truss bolsters, Congdon brake-shoes, Westinghouse air-brakes, M. C. B. couplers, Miner and Westinghouse friction draft rigging, Barber type trucks and C. M. & St. P. wheels.

#### BRIDGE BUILDING.

ALLENTOWN, PA.—A steel bridge will be built over the Lehigh River to connect the Sixth and Tenth wards. It is said it will cost \$100,000.

BOSTON, MASS.—The contract for the steel superstructure of Sections A and B of the new Broadway bridge has been let to the Boston Bridge Works at \$112,874.

BERRYVILLE, VA.—The county has voted to issue \$40,000 of bonds for a steel bridge about 1,500 ft. long.

BRADDOCK, PA.—At a meeting of the Council a few days ago the American Steel & Wire Co. presented a petition for permission to build three over-head bridges at its Ninth street plant.

BUCKLAND, OHIO.—Bids are wanted Nov. 28 by the County Auditor at Wapakoneta, for a bridge over Auglaize River near Buckland.

CHICAGO, ILL.—The lowest bids opened on Nov. 5 by the Drainage Board for the bascule bridges to be built over the Chicago River at Loomis street and at Eighteenth street, were submitted by Lydon & Drews Co., for the substructure, and the Jackson & Corbett Co., for the superstructure. The American Bridge Co., Chicago Bridge & Iron Co., C. L. Strobel and the Cambridge Co. bid for the superstructure.

It is said the Pennsylvania has accepted an ordinance to elevate many of the South Side tracks and build subways at about 15 streets.

The McCormick Harvesting Machine Co. has offered to rebuild or repair the Western avenue bridge provided the city allow the street railroad to build on Western avenue.

CINCINNATI, OHIO.—An ordinance has been introduced before the Board of Legislation to abolish the Harrison avenue grade crossing, and arrangements are being made to build a viaduct to cost \$250,000. The cost will be divided as follows: B. & O. S. W., 50 per cent.; C., H. & D. and the city, 25 per cent.; The Traction Company, 25 per cent.

DARDANELLE, ARK.—Bids are wanted Nov. 15 by the Road and Bridge Commissioner for a bridge over Bates Mill Creek, nine miles south of this place.

DES MOINES, IOWA.—The question of building a viaduct on Eighteenth street is again being considered by the Railroad Commissioners. It will cross the tracks of the Keokuk & Western and be paid for partly by that company and the city.

ELWOOD, TENN.—City Engineer J. A. Omberg, Jr., has received the plans for a \$10,000 bridge to be built at Broadway, near Elwood, by the Southern, the Frisco and the Nashville, Chattanooga & St. Louis railroads.



**EUREKA SPRINGS, ARK.**—See St. Louis & North Arkansas under Railroad Construction.

**HAGERSTOWN, MD.**—The question of building a steel bridge over the Shenandoah River at Castleman's Ferry has been decided in favor of the plan which provides for an issue of \$40,000 of bonds. The bridge will be 1,300 ft. long.

**KNOXVILLE, TENN.**—A bridge is proposed over Clinch avenue, and it is said that the Louisville & Nashville will confer with the city and the Knoxville Construction Co. in regard to joint construction.

**MARSHALLTOWN, IOWA.**—Preliminary steps have already been taken to build the viaduct over the tracks of the C. & N. W., Iowa Central and C. G. W. at Center street. It will be about 1,500 ft. long. The State Railroad Commissioners will have to act on the matter.

**MINNEAPOLIS, MINN.**—The International Bridge & Terminal Co., organized to build a bridge across the Rainy River from Itasca County, Minn., to Canada, has filed articles of incorporation with the Secretary of State in Minnesota. The capital stock is \$50,000 and the incorporators are Washington Gray, A. A. Avery, Edward L. Hollingsworth and others, of Minneapolis, in which city is the headquarters.

**NEW BERN, N. C.**—The Pamlico Construction Co. will build a bridge over Neuse River which will be about a mile long. Address Henry R. Bryan, Jr., at Bayboro.

**NEW LONDON, CONN.**—The Government Engineer for this district is considering the matter of the Central Vermont R. R. trestle across Smith's Cove, Thames River, which is said to be an unreasonable obstruction to free navigation.

**NILES, MICH.**—A steel viaduct will be built over the Michigan Central tracks by the South Bend & South Michigan Ry. Co.

**ONEIDA, N. Y.**—An appropriation has been voted for the Kenwood bridge.

**SAGINAW, MICH.**—Bids are wanted Nov. 26 for a bridge over Cass River, to cost about \$15,000. Herman H. Eymer, County Road Commissioner.

**SCHUYLERVILLE, N. Y.**—The Greenwich & Johnsonville R. R. will build a bridge at the crossing of the Hudson Valley Ry. at Fort Miller.

**SYRACUSE, N. Y.**—The Lackawanna R. R., which has for the past few years been rebuilding bridges, will, during the next year, take up the work on the line through Syracuse.

**TRAVERSE CITY, MICH.**—An estimate for a double arch concrete bridge has been made by the City Engineer of West Bay City, the cost to be \$16,500. A steel bridge will cost \$21,000.

**TRENTON, N. J.**—It is said extensive changes are under consideration on the Camden & Amboy line of the Pennsylvania. Part of this line is single track and it is now said that it will be double tracked and several bridges put in, the most important being a drawbridge over Rancocas Creek.

#### Other Structures.

**BEAUMONT, TEXAS.**—The shops of the Santa Fe at this place were destroyed by fire a few days ago. They were practically new, having been rebuilt after the fire some months ago.

**BURLINGTON, VT.**—This city is about to issue \$200,000 of bonds, part of which will be used in paying for a site to be given to the Rutland R. R. to build its shops.

**CANAL DOVER, OHIO.**—The American Sheet Steel Co. has made plans for 10 more mills to be built at its plant in this city.

**CANTON, OHIO.**—Plans are being made for the large car works to be built in Canton by the Structural Steel Car Co. This work was started some time ago but was stopped. In our issue of June 13, 1902, we briefly described this proposed plant; also described and illustrated some of the cars to be built by the company. H. A. Cavanah is Vice-President.

**CHICAGO, ILL.**—The Pullman Company will build a large addition to its Calumet shops at a cost of about \$75,000.

**CLEVELAND, OHIO.**—The Big Four and the Lake Shore & Michigan Southern contemplate building a new freight station on Front street next spring. Local reports state that the preliminary plans have been made.

**EL PASO, TEXAS.**—It is said that the several roads entering this city have agreed to build a union station in El Paso.

**GARWOOD, N. J.**—The Hall Signal Co. will enlarge its plant here. It is said the improvements will amount to \$50,000.

**IRWIN, PA.**—The Hockensmith Wheel & Mine Car Co. contemplates building new shops here.

**JOHNSTOWN, PA.**—The Cambria Steel Co. will add a department to its plant here to make railroad spikes.

**LAUREL, MISS.**—Plans for the new station for the Gulf & Ship Island R. R. have been made. It will be a brick structure 180 ft. long, and the general waiting room will be 16 x 24 ft.

**MOLINE, ILL.**—The Moline, East Moline & Watertown Ry. contemplates building car barns and a power house within the city limits of Moline.

**MONTREAL, QUE.**—Six of the new Canadian Pacific shop structures now building at Hochelaga, Montreal, have been let and Henry Goldmark, the engineer in charge, will soon call for bids for the seventh, a blacksmith shop of large dimensions.

**PORTSMOUTH, N. H.**—A coal storage and a coal handling plant will be built at the Government Navy Yard here and bids are wanted at Washington on Nov. 22.

**ST. PAUL, MINN.**—The Twin City Rapid Transit Co. will soon build new shops to build and repair cars. The location which has just been bought is within three miles of the Minneapolis electric plant. It is said that the works will employ about 1,000 men.

**SHARPSVILLE, PA.**—The Shenango Furnace Co., of Pittsburgh, has let contracts for two new furnaces at this place. Each will have a daily capacity of 600 tons. The company at present is remodeling one of the older stacks, and with the three small stacks now in operation, the total capacity will be 475,000 tons a year.

**SOMERS POINT, N. J.**—The Shore Electric Co. will in-

stall new equipment in its power plant here. W. E. Hunt, 1321 Filbert street, Philadelphia, is in charge.

**TORONTO, ONT.**—Local reports state that plans are under way to build an iron and steel works in Toronto. Several of the local aldermen seem to be informed about this project.

**WARREN, OHIO.**—W. C. Winfield, C. A. Crane, C. B. Selby and others of this place, have organized a company to make sheet metal goods in a plant to be built in this place.

#### MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

##### St. Louis Railway Club.

The regular monthly meeting was held Friday, Nov. 14, in the Southern Hotel. The paper presented and discussed was by Mr. W. M. Prall, Manager Central Car Service Association, on "Per Diem as a Standard of Measurement and Per Diem Rules as Practically Applied at St. Louis Terminals."

##### Western Railway Club.

The regular monthly meeting will be held in the Auditorium Hotel, Chicago, Tuesday, Nov. 18. The papers to be presented are "Machine Tools," by Mr. Jas. K. Cullen, of the Niles Tool Works, and "Self-Cleaning Locomotive Front Ends," by Mr. Frank Slater, Master Mechanic, Chicago & North Western R. R.

##### North-West Railway Club.

A regular meeting was held at the West Hotel, Minneapolis, Tuesday evening, Nov. 11, 1902, at 8 o'clock p.m. The discussion on Mr. Fergusson's paper on "Drawbar Pull Rating" was continued. A committee, consisting of Messrs. Barber, of the C. G. W. Ry.; Zachritz, of the Soo Line, and Parker, of the C., M. & St. P. Ry., reported on "Passenger Car Cleaning."

##### Pacific Northwest Society of Engineers.

The Pacific Northwest Society of Engineers held a regular monthly meeting at the Chamber of Commerce rooms in Seattle, Wash., on Saturday, Nov. 1, at 8 p.m. A paper was read by Mr. J. M. Clapp, Assistant United States Engineer, on "The Improvement of Gray's Harbor, Wash." Mr. Clapp was the government engineer in charge of this work at the time of its construction. The paper was very complete in every detail, dealing first with the preliminary survey work; the construction of the plant necessary to carry on this work, which involved an expenditure of \$316,000; the manner in which the piles for the railroad tracks along the jetty were driven, and how the mattresses for the foundations of the jetty were made and loaded with rock and sunk into position, and how the balance of the sea wall was completed.

##### National Geographic Society.

This Society announces a course of popular lectures and technical meetings for the season of 1902-1903, at Washington, D. C. The popular lectures will be given in the National Rifles Armory every two weeks, beginning Nov. 14, the subjects being: "The Coal Resources of the United States," by Dr. D. T. Day, Chief of the Division of Mineral Resources, U. S. Geological Survey; "Explorations in the Arctic 1898-1902," by Commander Robert E. Peary, U. S. Navy; "Argentina—Present and Future," by Mr. F. L. Corthell; "The Turk and His Rebellious Subjects," by Mr. William E. Curtis; "The Tragedy of St. Pierre," by Mr. George Kennan. Other lectures will probably be on Colombia and the Isthmian Canal and several others. At the technical meetings to be held at the Cosmos Club and to alternate with the popular lectures, some of the subjects will be: "The Work of the United States Coast and Geodetic Survey," by Dr. O. H. Tittmann, Supt. of the U. S. Coast and Geodetic Survey; "The Work of the U. S. Weather Bureau," by Dr. Willis L. Moore, Chief of that Bureau, and "The U. S. Signal Corps," by Gen. A. W. Greely, Signal Officer.

##### The Engineers' Club of Philadelphia.

The 25th anniversary of the Engineers' Club of Philadelphia will be celebrated by a banquet at the Union League on the evening of Saturday, Dec. 6, at 6:30 o'clock. Information may be obtained by addressing any of the undersigned Chairmen, constituting the Executive Committee: Henry J. Hartley, President and ex-Officio; James Mapes Dodge, Speakers; H. G. Riebenack, Decorations; and Menu; Charles Hewitt, Music; George T. Gwilliam, Finance, Treasurer; Thos. C. McBride, Invitations, Secretary.

A business meeting will be held on Saturday, Nov. 15, at 8 o'clock p.m. The paper will be "Philadelphia High-Pressure Fire Service," illustrated, by John E. Codman.

The Information Committee has arranged a tour of inspection of the Roxborough filtration plant for the afternoon of Nov. 15. Weather permitting, the 1:23 train will be taken from the Reading Terminal, meeting special trolley cars at Shawmont to convey the party to the plant. Members so desiring can take a later train to Wissahickon station and reach the plant on the Norristown trolley.

At the meeting on Nov. 1 Mr. William D. Beatty presented the paper upon "Some Features of the Guayaquil & Quito Railway, Guayaquil, Ecuador, S. A." By the aid of lantern illustrations he described the general character of the country and the engineering details involved in constructing this railroad across the Andes Mountains. The subject was discussed by Messrs. John C. Trautwine, Jr., Carl Hering and others.

Mr. Arthur Falkenau exhibited and described a recently constructed machine, of small size, for testing wire especially for use in cables. The methods of making such tests were discussed by Messrs. Edgar Marburg, Charles Hewitt, Geo. M. Sinclair and others.

#### PERSONAL.

—Mr. John M. Fraser, formerly General Superintendent of the United States Express Company, died Nov. 8. He was 63 years old and had been in the express business a great many years prior to his retirement in 1895.

—Mr. Frank H. Marsh, at one time Assistant General Superintendent of the Wisconsin Central, died at Helena, Mont., Oct. 29. Mr. Marsh was 47 years old

and was born at Monroeville, Ohio. His railroad service dates from 1869, when he began as a telegraph operator on the Lake Shore & Michigan Southern. He was at one time Superintendent of the Yellowstone Division of the Northern Pacific. His service with the Wisconsin Central dates from 1890, when he began as a Division Superintendent.

—Mr. E. T. Reisler, Division Superintendent of the Erie Railroad, was born in Maryland in 1864. Graduated from Lehigh University as a Civil Engineer in 1887 and started his railroad service in July of that year as transitman for the Erie. He was made Assistant Engineer the following year; roadmaster in 1890; freight trainmaster in 1899, and passenger trainmaster in 1900. As will be seen Mr. Reisler's entire service has been with the Erie. He assumed the Superintendency on Nov. 1.

—Mr. T. H. Pindell, Superintendent of the Susquehanna and Tioga Divisions of the Erie Railroad, was born in 1861. He began his railroad service with this company in 1887 as a clerk in the Superintendent's office, later becoming stenographer, and passed through the positions of operator and train despatcher until 1891, when he was appointed chief despatcher and two years afterwards became chief clerk in the transportation office. In 1897 he was appointed Superintendent of the New Jersey & New York Railroad and the Northern Railroad of New Jersey, from which position he has been transferred as above.

—Mr. A. S. Cheever, the new Superintendent of the Fitchburg Division of the Boston & Maine, was formerly Assistant Chief Engineer. Mr. Cheever was born at Chelsea, Mass., in 1857, and his railroad service dates from 1880, when he started with the Fitchburg. For five years (1881-1886) he held various subordinate positions in the Chief Engineer's office, finally becoming Assistant Engineer. In 1887 he was appointed Division Engineer in charge of the Western Division and remained in this position for three years. In 1890 he was appointed Chief Engineer and continued as such until July 1, 1900, when he became Assistant Chief Engineer of the Boston & Maine, from which position he has just resigned to take the Superintendency of the Fitchburg Division.

—Mr. H. J. Horn, Assistant General Superintendent of the Northern Pacific, was born at St. Paul, Minn., graduated from the Massachusetts Institute of Technology as a Civil Engineer in 1888, and in June of that year became Assistant Engineer of the Chicago & Great Western. The following year he resigned to go with the Northern Pacific as draftsman, and was Assistant or Resident Engineer from June, 1890, to August, 1893. In October, 1893, he was appointed Supervisor of Bridges and Buildings, and four years later became Superintendent of the Montana Division at Livingston, from which position he has just been appointed to the Assistant General Superintendency with jurisdiction over the Yellowstone, Montana and Rocky Mountain Divisions.

—Mr. Frank O. Melcher, Superintendent of the Chicago, Rock Island & Pacific, was born at Damariscotta, Me., in 1864. Graduated from Tufts College with the degree of A.M.B. in 1887 and with the degree of C.E. in 1895. He entered railroad service in 1887 as instrumentman on the Fitchburg, and has been consecutively to 1897 Assistant Engineer and Chief Engineer of the same road. Then for one year (1897-1898) was Division Superintendent and then General Superintendent. At the time of the lease of this railroad to the Boston & Maine Mr. Melcher was retained as Superintendent of the Fitchburg Division. He resigned from this position on Nov. 6 to go to the Rock Island. Mr. Melcher is a Member of the American Society of Civil Engineers.

—Mr. J. C. Vining, Superintendent of Transportation of the Colorado Midland, started in life as a news-boy in New York city. In 1880 he went west and became freight brakeman on the Northern Pacific. In 1884 he went to the Southern Pacific, but later resigned to go with the Santa Fe, working alternately as agent and operator until 1891. From this company he went to the Denver & Rio Grande. In 1895 he was sent to Grand Junction in charge of the terminal, but returned to Denver the next year. In 1900 he took the position of Trainmaster on the Colorado Midland, from which position he was promoted on October third last to Superintendent in charge of Transportation. Mr. Vining has taken an active interest in the Local Freight Agents' Association of the United States and has introduced a number of new forms of accounting.

—Mr. T. S. Tutwiler, Assistant Chief Engineer of the Atlantic Coast Line, is a native of Virginia, having been born at Lexington in 1855. Is a graduate of Washington and Lee University (Civil Engineer) class of 1877. For one year (1879-1880) Mr. Tutwiler was Principal of the High School in Salem, Va. His railroad career dates from 1880, when he became a rodman on the Richmond & Allegheny Railroad, which is now a part of the Chesapeake & Ohio. He remained there until August, 1881, when he went to the Georgia Pacific as Assistant Engineer in charge of location and construction, where he remained two years. He held a similar position with the Plant Investment Company, being in charge of docks, wharves, etc. He later became Chief Engineer of the Savannah, Florida & Western and assumed the duties of Assistant Chief Engineer of the Atlantic Coast Line the first of November.

—All hope of finding Mr. B. F. Egan, Division Superintendent of the Great Northern Railroad, alive has been abandoned, and efforts are now being made toward the recovery of his body. Mr. Egan, in company with five railroad officers, left Belton, Mont., Tuesday, Nov. 4, to hunt between Coram and Belton. After establishing a camp they separated, agreeing to meet at a certain place and return home. All reached the appointed place except Mr. Egan. Mr. Egan not returning by Wednesday morning the railroad company employed 50 men to search for him and an engine was detailed to run up and down the line for several miles, blowing the whistle. A heavy snow storm came up during the first day, and continued several days. Mr. Egan was a native of Illinois, having been born at Amboy in 1862, and had been connected with different companies in various capacities. His services with the Great Northern began in 1890, when he became Assistant Division Superintendent.

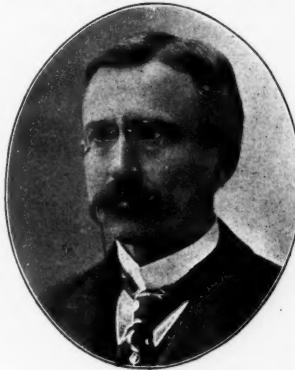
—Mr. E. E. Kerwin, who recently succeeded Mr. Richey as Superintendent of the New Jersey Central and Lehigh & Susquehanna Divisions of the Central Railroad of New Jersey, was born at Turner, N. Y., in 1861. His railroad service dates from 1871, when he started as a water boy for the Erie and continued in this position and as track laborer until 1883, when he entered the telegraph office at Central Valley. Mr. Ker-



win remained with this company until November, 1883, when he resigned to go with the West Shore. In March, 1885, he became telegraph operator for the Union Pacific at Rock Creek, Wyo., where he remained for eight months and was for a short time afterwards with the Chicago, St. Paul, Minneapolis & Omaha as a yard clerk. In 1889, he went to the Chicago Great Western as telegraph operator, and in a few months was promoted to be train despatcher, where he remained until 1890, when he resigned to take a similar position with the Iowa Central. From then until 1897 he passed through various subordinate positions, later going with the Central of New Jersey as Trainmaster, finally becoming Superintendent as stated above.

—Mr. Thaddeus B. Keeler, Chief Electrician of the Pneumatic Signal Company, was instantly killed Oct. 30, by a train on the draw bridge of the New York Central & Hudson River Railroad over the Harlem River. Mr. Keeler was directing a gang of machinists who were putting in pneumatic signals. It is supposed that he forgot, for a moment, the fact that the trains run on the left-hand track. Quite early in his life Mr. Keeler entered the employ of the New England Telephone Company, where he showed ability as an inventor, and some of the wire stringing devices now used are due to his suggestions. In 1892 he entered the service of the Johnson Railway Signal Company and was engaged in the installation of the block system on the New York Central, and on other important work. He was in charge of the signal company's installation at the World's Fair, at Chicago. On the organization of the Standard Signal Company he entered the employ of that company and remained with its successor, the Pneumatic Signal Company up to the time of his death. While with this company he invented several important devices. He was an excellent workman, modest and genial, and has left many warm friends.

—Mr. Ira A. Place, who has just been made General Attorney for the New York Central & Hudson River Railroad, is a graduate of Cornell University, class of 1881. Immediately after graduating Mr. Place began to study law in Syracuse in the office of Mr. I. G. Vann, now one of the Judges of the Court of Appeals, and Mr. P. B. McLennan, one of the Judges of the Appellate Division of the Supreme Court, Fourth Department.



The firm were the local attorneys for the New York, West Shore & Buffalo, which was then being built through that part of the State, and Mr. Place had to do with the acquisition of the right of way of the West Shore. In 1883 he was admitted to the bar and in the same year went to New York city with Mr. McLennan, who was General Counsel for the New York, West Shore & Buffalo. He remained in the law department of the West Shore during its receivership and upon its reorganization, and soon after its lease to the New York Central & Hudson River in 1886, he entered the law department of the latter company as Assistant to the General Counsel and has been in this department ever since, becoming Chief Assistant under Judge Williamson. Mr. Place has had much to do with the litigation of the company for the last 10 years, his most important work, perhaps, being the litigation in respect to Park avenue and the lands acquired from the State under the waters of the Hudson River. Mr. Place is a member of several prominent clubs.

It is particularly gratifying to record this change in that it is a promotion within the organization of the company. Undoubtedly Mr. Newman must have been led to consider very carefully the idea of going outside and getting some man already famous at the bar. Mr. Place's steady service, all of his professional life, with practically the same corporation has kept him from acquiring much of that over-rated asset which we call fame, and unquestionably there must have been men in the directory and the official staff who urged the appointment of some man more widely known. And yet, that kind of service is precisely what best fits a man for the responsibility of the higher place, provided he has capacity, and of this there is no question in this case. But, further, such a promotion has an important effect all through the organization. One of the most valuable properties of a railroad company is the morale of the staff—possibly it is the most valuable. But zeal and fidelity in the service and pride in the company are qualities of slow growth, and that growth is easily checked.

#### ELECTIONS AND APPOINTMENTS.

**Alabama Great Southern.**—See Queen & Crescent.

**Atlanta, Knoxville & Northern.**—See Louisville & Nashville.

**Baltimore & Ohio.**—H. N. Breneman, Master Mechanic at Newark, Ohio, has resigned. (See Chicago, Milwaukee & St. Paul.)

**Baltimore & Ohio Southwestern.**—J. C. Hagerty, heretofore Trainmaster, has been appointed Division Superintendent, with headquarters at Washington, Ind., succeeding L. C. Fritch, resigned owing to ill health.

**Canadian Pacific.**—F. Dillinger has been appointed Acting Superintendent, with headquarters at Winnipeg, Man.

**Central Ontario.**—S. J. Ritchie has been elected Vice-President, with headquarters at Akron, Ohio. G. Collins, heretofore General Superintendent, has been appointed Receiver and Manager, with headquarters at Trenton, Ont.

**Chesapeake Beach.**—Otto Mears, General Manager, having resigned, the duties of that office will, until further orders, be assumed by the President. Paul Y. Waters has been appointed Traffic Manager, with headquarters at Washington, D. C., succeeding A. H. Lewis, General Freight and Passenger Agent, resigned. Paul Y. Waters succeeds Mr. Lewis as Auditor. W. J. Hayward has been appointed Superintendent, with headquarters at Washington, D. C., succeeding W. A. Beerbower, resigned.

**Chicago & North Western.**—A. L. Goetzmann, heretofore Assistant Division Superintendent, has been appointed

Division Superintendent, with headquarters at Winona, Minn., succeeding H. R. Sanborn, resigned to go to the Rock Island.

**Chicago, Milwaukee & St. Paul.**—H. N. Breneman, heretofore Master Mechanic of the Baltimore & Ohio, has been appointed Assistant Superintendent of Motive Power of the C., M. & St. P., with headquarters at West Milwaukee, Wis.

**Chicago, Rock Island & El Paso.**—W. B. Leeds has been elected President and R. Mather Vice-President.

**Chicago, Rock Island & Pacific.**—J. F. Holden, heretofore Traffic Manager of the Choctaw, Oklahoma & Gulf, has been appointed Assistant Freight Traffic Manager of the C., R. I. & P., with headquarters at Chicago. Mr. Holden's appointment will in no way affect Mr. Gower, Assistant Freight Traffic Manager at Chicago.

C. L. Nichols has been appointed Division Superintendent, with headquarters at Fairbury, Neb.

C. N. Gilmore, Division Superintendent, with headquarters at Des Moines, Iowa, has resigned. (See Chicago & North Western.)

**Choctaw, Oklahoma & Gulf.**—See Chicago, Rock Island & Pacific.

**Cincinnati, New Orleans & Texas Pacific.**—See Queen & Crescent.

**Cincinnati, Richmond & Muncie.**—H. K. Mudd has been appointed Master Mechanic, with headquarters at Richmond, Ind., succeeding T. E. Merritt, resigned, effective Nov. 10.

**Cleveland, Cincinnati, Chicago & St. Louis.**—E. F. Cost, Freight Traffic Manager, with headquarters at Cincinnati, Ohio, has resigned.

**Colorado & Southern.**—Joseph Ost has been appointed Purchasing Agent, with headquarters at Denver, Colo., succeeding A. L. Cochran, assigned to other duties.

**Denver & Rio Grande.**—David Patterson, heretofore joint Master Mechanic of this company, the Rio Grande Western and the Colorado Midland, has been transferred as Master Mechanic of the D. & R. G., with headquarters at Salida, Colo. M. Shirmir succeeds Mr. Patterson at Grand Junction, Colo.

**Eastern Texas.**—The headquarters of P. A. McCarthy, Chief Engineer, have been removed from Kennard, Texas, to Lufkin, Texas.

**Florida & Georgia.**—The headquarters of F. Larkins, Treasurer and Traffic Manager, have been removed from White Springs, Fla., to Jacksonville.

**Kansas City, Mexico & Orient.**—C. D. Randall has been appointed Assistant Chief Engineer, with headquarters at Kansas City, Mo.

**Lake Shore & Michigan Southern.**—H. A. Worcester, Superintendent of the Detroit Division, has been transferred to Buffalo, N. Y., succeeding T. W. Niles, who has been appointed to succeed Mr. Worcester, at Detroit.

**Lehigh Valley.**—B. P. Flory has been appointed Mechanical Engineer, with headquarters at South Bethlehem, Pa., succeeding F. F. Gaines, transferred.

**Louisville & Nashville.**—R. Montfort (Chief Engineer of the L. & N.) has been appointed Chief Engineer of the Atlanta, Knoxville & Northern, and W. H. Courtenay, Principal Assistant Engineer of the L. & N., assumes a similar position with the A., K. & N.

**Mexican Central.**—H. R. Cornforth has been appointed Division Superintendent, with headquarters at Guadalajara, Mex., succeeding A. C. Hobart, transferred.

**Missouri, Kansas & Texas.**—T. S. McDowell, Division Superintendent of the M., K. & T. of Texas, has been appointed Division Superintendent of the M., K. & T., with headquarters at Denison, Texas, succeeding D. Sullivan, resigned.

**Missouri, Kansas & Texas of Texas.**—J. W. Walton has been appointed Division Superintendent, with headquarters at Smithville, Texas, succeeding T. S. McDowell, transferred. W. E. Williams succeeds Mr. Walton as Division Superintendent at Greenville, Texas. (See Missouri, Kansas & Texas.)

**Mobile & Ohio.**—A. J. Alexander, heretofore Trainmaster, has been appointed Superintendent of the Mobile Division, with headquarters at Meridian, Miss., succeeding J. D. Clark, resigned on account of ill health.

**New York Central & Hudson River.**—E. L. Rossiter has been elected Treasurer, and W. A. Greer, T. F. McLane and M. F. Barger, Jr., Assistant Treasurers.

**Northern Pacific.**—The Tax and Right of Way and Lease Departments are to be abolished and the Department of Real Estate, Right of Way and Taxes is to be substituted. This Department is to have charge of all the real estate and real property interests of the company, excepting land grants, all matters of right of way now held or hereafter acquired, all leases of real estate, including leases of right of way, taxes on all property, including those of the land grant; all real estate, rights of way, leases and taxes of other companies operated by the N. P. G. S. Fernald, who has been commissioner of the old department will continue as commissioner in the new.

J. E. Goodman has been appointed Master Mechanic.

**Pacific Coast Railway.**—The officers of this company are: Edwin Goodall, President; J. F. Lawless, Manager; J. D. Amos, Auditor; L. S. Blake, Cashier; C. D. Dunann, General Passenger Agent; J. H. Cooper, General Freight Agent, and E. W. Clark, Superintendent.

**Pennsylvania.**—H. Montgomery has been appointed Master Mechanic, with headquarters at Oil City, Pa., succeeding D. E. Cassidy, transferred.

**Pullman Company.**—The following changes among the District Superintendents have been made: District Superintendent J. C. Patterson has been transferred to Kansas City; District Superintendent E. N. Leamaster to El Paso; District Superintendent S. M. Carley to New Orleans; District Superintendent J. C. Morrison, at New Orleans, has been granted leave of absence, and District Superintendent E. F. Hilton has been transferred to Communipaw.

**Queen & Crescent.**—M. W. Maguire has been appointed General Superintendent of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern, with headquarters at Cincinnati, Ohio. The position of Acting Assistant General Manager has been abolished. A. Griggs has been appointed Superintendent of the A. G. S.

**Rutland.**—At a meeting of the stockholders held recently H. H. Powers, F. D. Proctor, A. G. Spaulding and E. F. Gebhardt were elected Directors.

**St. Louis, Kansas City & Colorado.**—The officers of this company are: President and Chairman of the Board, W. B. Leeds; Vice-President, Robert Mather; Assistant Secretary, George H. Crosby; Treasurer, F. E. Haynes, and Assistant Treasurer, C. F. Gilson.

**Susquehanna, Bloomsburg & Berwick.**—F. H. Eaton has been elected Vice-President, with headquarters at New York city, and S. T. McCormick, General Counsel, with headquarters at Williamsport, Pa.

**Vera Cruz & Pacific.**—R. B. Pogram, formerly Assistant General Manager of the Southern, has been elected President of the V. C. & P., with headquarters at Orizaba, Mexico.

**Washington County.**—W. L. Cobb has been appointed Acting General Auditor, with headquarters at Calais, Me.

**West Virginia Central & Pittsburgh.**—G. B. Owen, formerly Division Engineer of the Baltimore & Ohio, has been appointed Engineer of Maintenance of Way of the W. V. C. & P., with headquarters at Elkins, W. Va., succeeding J. W. Stearns, resigned.

#### RAILROAD CONSTRUCTION.

##### New Incorporations, Surveys, Etc.

**ALABAMA ROADS.**—An officer writes that a line has been surveyed for a railroad to be built in connection with mill property recently purchased by the Pierson Lumber Co. at Andalusia, Ala. Four miles of the line will be built within six months, and the balance, making a total of about 20 miles, for which the route has not yet been entirely decided, will be built within a year from date. The road is primarily designed for logging purposes but will also carry freight and passengers. It will be built by the lumber company without outside contracts. A small force is at work at the present time. R. M. Pierson, Andalusia, Ala., is General Manager.

The Holmes Lumber Co. reports five miles of logging road just completed in the interior of Monroe County, Ala. It is proposed to build about five miles more in connection with this. Dr. Sibley Holmes may be addressed at Finchberg, Ala.

**ATLANTIC & BIRMINGHAM.**—An officer sends the following report of progress: No building is being done at the present time beyond Montezuma, Ga., but preliminary surveys have now been carried to within about 25 miles of Birmingham from Montezuma, and will soon be completed to Birmingham. They are being made with the intention of finding out whether or not the line is favorable and will be profitable to build. Nothing can be determined, therefore, about the work beyond Montezuma until the surveys are completed. Between Cordele and Montezuma the road is ready for track laying, which will probably be completed during December. (May 2, p. 335.)

**ARKANSAS WESTERN.**—There are new reports to the effect that this new line between Heaven, Ind. T., and Waldron, Ark., 32 miles, will be extended from Waldron to Hot Springs, Ark., 82 miles beyond. C. C. Godman, of Fort Smith, Ark., is President and General Manager. The company was incorporated in 1899. (Feb. 21, p. 137.)

**BEAUMONT, SOUR LAKE & HOUSTON (ELECTRIC).**—Permanent surveys are being made for this projected electric line between the points named in Texas, a distance of about 80 miles. The charter will be filed as soon as the survey is completed, and it is said that contracts will be let about Dec. 20. The road is designed to operate tank cars, besides a regular passenger and freight business. According to the present plans, all freight traffic will be handled at night. Edward Kennedy, Houston, Texas, may be addressed.

**BEDFORD & WESTERN.**—This company was chartered Oct. 27 to build a steam railroad from a point at or near Mt. Dallas, Bedford County, Pa., to a point at or near Geigers, Somerset County, Pa., 50 miles. Geo. H. Stein, of Philadelphia, is President.

**BUFFALO & SUSQUEHANNA.**—Contract for the new 50-mile extension from Sinnemahoning, Potter County, to DuBois, has been sub-let to Frank Greco, of Galeton, Pa. (Oct. 24, p. 825.)

**BUFFALO, ROCHESTER & PITTSBURGH.**—An officer writes that the following work is being done at the present time: An extension is being built from Indiana Branch Junction, three miles north of Punxsutawney, on the main line south to Black Lick, a distance of 45 miles. About 30 miles of this is practically graded and ready for track laying. The balance will be graded and ready for track laying in the spring of 1903. There is considerable heavy work on this 45 miles, including one tunnel 700 ft. long, and several bridges, all of which are now under contract. Improvements made on the main line during the present season include six miles of second track built between Lane's Mills, Pa., and Falls Creek, which was put in operation Nov. 1. Nine miles of second track is also building between Johnsonburg, Pa., and Ridgway, on five miles of which grading is completed. Track is now being laid on this section which will be completed and in operation by Dec. 15. Four miles of second track is also building between Bradford and Howard, Pa., and six miles between Carrollton and Great Valley, which is nearing completion. The work between Carrollton and Great Valley consists of rebuilding three bridges, raising the grade on two of them and lowering the grade on the third. The grade at this point is being changed from 50 ft. to the mile, to a maximum of 21 ft., which will constitute a great improvement in the handling of trains. Plans for next year are not yet completed.

**CANE BELT.**—An officer denies current reports that an extension will be built at the present time between Eagle Lake and Houston, Texas.

**CHICAGO & ALTON.**—Surveys are reported for a cut-off from Littleby, Mo., to Old Monroe, in Lincoln County, a distance of about 60 miles. The object of the new line, if built, would be to reduce the distance between Kansas City and St. Louis, as the present route between Littleby and Old Monroe is roundabout and the cut-off would save 50 miles or more between these two points.

**CHICAGO & NORTH WESTERN.**—Rights of way are reported purchased for a new line from Choate, Mich., through Ewen to Mass City, to connect with the Copper Range R. R. The projected distance is about 27 miles.

**CHICAGO, ROCK ISLAND & PACIFIC.**—An officer writes in regard to current reports that an extension is to be built from Morris to St. Louis, Mo., that surveys are being made between these points, but no further plans have been perfected as yet.

**CHOCTAW, OKLAHOMA & GULF.**—An officer is quoted as saying that grading is practically completed on the



extension to Guthrie, Okla. T., from Holdenville, Ind. T., which will be about 50 miles long.

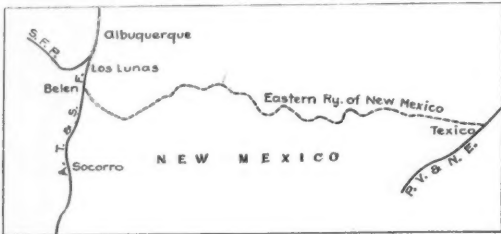
Work is also reported in progress on a line between Wilburton and Haileyville, 18 miles, to carry coal.

**COAL CREEK.**—Articles of incorporation for this company have been filed in the State of Washington. It is proposed to build from a point on the Columbia River, in Section 36, Township 8, Range 3, west in Cowlitz County, across the State of Washington to the northern boundary. W. H. Moody, Albert Bettinger and J. P. McNery are the incorporators.

**COLONISATION DU NORD.**—Contract to build this line from Labelle, Que., to Nominique, 26 miles, was let some time ago to D. R. McDonald & Co., Williamstown, Ont., and grading has been practically completed. Honorable J. D. Rolland, of Montreal, is President. (July 25, p. 600.)

**DURHAM & CHARLOTTE.**—Most recent reports concerning the proposed extensions of this line which is now being worked between Gulf and Star, N. C., 34 miles, state that preliminary lines have been run from Gulf to Durham by way of Pittsboro. Three miles have been located and one mile graded on this part of the line which will be 14 miles long. On the extension from Star to Troy, which is now being built, about three miles of the projected seven are ready for track laying. (Nov. 7, p. 864.)

**EASTERN OF NEW MEXICO (ATCHISON, TOPEKA & SANTA FE).**—This company will build from Belen, between Albuquerque and El Paso, on the main line, in an easterly direction to the Pecos Valley & Northeastern at Texico, providing a cut-off which will shorten the trans-continental line of the Atchison, Topeka & Santa Fe and avoid certain severe grades in the Glorieta and Raton passes. The distance is about 275 miles. Refer-



ence to the project is made, as above, in a pamphlet issued to stockholders who will also be asked at their next meeting to approve and ratify the purchase of the other companies of which the Atchison has recently purchased control under authority of the Board of Directors. The Atchison System, as thus consolidated, will include about 8,500 miles.

**GREAT NORTHERN.**—Track laying on the cut-off between the Great Northern and Canadian Northern railroads between St. Vincent, Minn., and Emerson, Man., about 2 1/4 miles, will be completed shortly.

**HASKELL-ARILENE.**—It is said that contracts will be let in a few days to grade the projected line between these points, which is to be built by way of Anson. The distance from Haskell to Anson is about 29 miles, and Arilene is some distance beyond. The projected line would pass through Stamford, which is a terminus of the Texas Central. C. C. Waller may be addressed at Haskell, Texas.

**JACKSON-LOST CREEK.**—Surveys are to be made for a new line between these points in Kentucky, 25 miles distant. Lost Creek is the center of a bituminous and camel coal region. Captain C. J. Little, President of the Lost Creek Coal Co., may be addressed.

**JIMULCO MINING CO.**—It is said that a narrow gauge road will be built from the line of the Mexican Central to this company's mines in the State of Coahuila, Mex., seven miles. The route has been located and grading will begin at once.

**JOHNSON CITY, HARRISBURG & OHIO RIVER.**—Press reports state that a new line is to be built from the southern Illinois coal fields to the Ohio River, connecting with the Chicago & Eastern Illinois and the Illinois Central at Johnson City, and passing through the coal fields of Saline County. The names of the interested parties are not stated.

**KINSTON & CAROLINA.**—Charter was granted this company Nov. 5 in North Carolina, to build from Kinston through portions of Lenoir, Duplin and Pender Counties to some point on the Wilmington & Weldon branch of the Atlantic Coast Line, a distance of about 60 miles. The company now works a freight line 22 miles long which does a small business. W. C. Swift, C. F. Harvey and others, of Kinston, N. C., are interested. Incorporation of this projected extension was applied for last January. (Jan. 17, p. 49.)

**KOOTENAY, CARIBOU & PACIFIC.**—Application will be made at the next session of the Dominion Parliament to incorporate this company, which proposes to build northwest from Golden, B. C., to Yellowhead Pass and thence to Port Simpson, with branches. Harvey & McCarter, solicitors, Fort Steele, B. C., may be addressed.

**LAC SEUL, RAT PORTAGE & KEEWATIN (ELECTRIC).**—An application is to be made at the next session of the Ontario Legislature to incorporate a company with this title, which proposes to build an electric line in a southerly direction from Lac Seul, in the Rainy River District of Ontario, by way of Keewatin and Rat Portage to a point on Shoal Lake, near the Mikado mine. C. W. Chadwick, of Rat Portage, is a promoter.

**LIMA-COLUMBUS.**—A new route for a steam railroad between these points in Ohio is being surveyed, passing through Belle Center, Waynesfield, West Mansfield and other points. The total distance is about 78 miles.

**LOUISVILLE & NASHVILLE.**—Most recent advices in regard to the extension which is to be built from a point near Hughes Siding, Ala., about seven miles north of Birmingham, to coal fields in Jefferson County, state that grading is in progress. Dunn & Lalande Bros., of Birmingham, are the incorporators. (Oct. 10, p. 785.)

**MAINE CENTRAL.**—An officer denies that there is any truth in current reports that rights of way have been secured for continuing the line from Rockland, Me., to Belfast, 28 miles.

**MANITOBA ROADS.**—C. E. Hamilton, of St. Paul, Minn., has given notice of an application to be made at the next session of the Manitoba Legislature for an act to incorporate a company to build an extensive system of railroads in Manitoba, connecting Emerson and Winnipeg, Emerson and Lake Winnipegosis, etc.

**MERCED-YOSEMITE.**—Surveys began Oct. 27 for a railroad between these points in California, 28 miles distant,

by way of Merced Canyon. It is said that the Crocker estate will build the road. C. D. Martin, who may be addressed at Stockton, Cal., is the Engineer in charge.

**MERIDA & PETO.**—This company, which operates in the Peninsula of Yucatan, has been granted a concession to build a branch 37 miles long. Miguel Medina, of Tekax, Yucatan, Mexico, may be addressed. (See *Railroad Gazette*, Oct. 10, p. 774.)

**METROPOLITAN ELEVATED (CHICAGO).**—At a meeting of shareholders Nov. 6 an amendment to the by-laws was ratified providing for a new downtown terminal, of which the estimated cost is about \$1,300,000, over one-half of which is the real estate purchased.

**MEXICAN NATIONAL.**—Press reports state that an extension from Ojo Calientes, southeast to San Luis Potosi, a distance of about 100 miles, will be built. The projected line would parallel the Mexican Central for a portion of the distance.

**MITCHELL, WEST BADEN, FRENCH LICK & JASPER.**—Surveys have been completed for the projected line between the points named in Indiana. The route, as located, is 39 miles, and the maximum grade is 1 1/2 per cent., except for one mile of 2 per cent. grade. Elections have been held in various townships along the line to raise a subsidy to aid the builders. Walter E. Brown, Geo. W. Clawson and others, of St. Louis, are interested. (Oct. 10, p. 785.)

**MUSKOGEE SOUTHERN.**—Contract to grade the first 10 miles of this projected line in Indian Territory has been let to J. J. Harmon. The line was chartered in October to build a north and south line across Indian Territory, with the ultimate intention of extending beyond. C. N. Haskell, W. T. Hutchins and others, of Muskogee, Ind. T., are interested. (Oct. 17, p. 805.)

**NOME-COUNCIL CITY.**—Surveys are reported completed for a narrow gauge line between these points in the Yukon region, 60 miles distant. The country is level and presents no especial engineering difficulties, and it is thought that the road will be built next summer, as a considerable amount of capital is reported to be raised.

**NORTHERN TEXAS TRACTION.**—This company, which intends to build as its base line an electric road between Fort Worth and Dallas, Texas, is now planning extensions from Fort Worth to Weatherford, 31 miles; to Denton, 33 miles, and to Cleburne, 23 miles. The total length of the main line is 36 miles, and of the extension 87 miles, making 123 miles in all projected. Geo. T. Bishop, of Cleveland, Ohio, is President. (Sept. 27, p. 676.)

**OKLAHOMA CITY & WESTERN (ST. LOUIS & SAN FRANCISCO).**—An officer writes that work is progressing rapidly on the new line from Chickasha to Quanah, Texas, and it will probably be in operation by January or February. It is a portion of the line between Oklahoma City and Quanah, which will be about 180 miles long, and is being built by Johnston Bros., contractors.

**OREGON SHORT LINE.**—An officer denies absolutely the widely circulated press reports that the company intends to operate a trans-Pacific steamship line.

**PARAUANDIRO-IRAPUATO.**—Concession to build a railroad between these points in Mexico has been granted to Albert J. Peyton. The first named is in the State of Michoacan; the latter in the State of Guanajuato, and the distance is about 50 miles.

**PENNSYLVANIA.**—President Cassatt is quoted as saying that work is constantly in progress straightening the line between Philadelphia and New York, removing grade crossings, elevating tracks, etc. When the improvements are completed, it is expected to make the run between Philadelphia and New York in an hour and a half; between Baltimore and New York in 3 1/4 hours, and between Washington and New York in four hours.

New yards have been authorized at Lovett, on the South Fork Branch of the Pittsburgh Division. A contract for grading has been let to the Columbia Contracting Co. The estimated cost of the work is \$225,000. The new yards are intended to relieve the congestion of the yards at South Fork, where connection is made between the South Fork Branch and the main line of the Pittsburgh Division.

Surveys are reported for a short cut-off from Gap, on the main line, to Shenks Ferry, on the Columbia & Fort Deposit R. R. The new line, if built, will shorten the distance between Columbia and Gap by about eight miles, and will avoid several grades.

**PENNSYLVANIA, MONONGAHELA & SOUTHERN.**—Charter was granted this company in Pennsylvania Oct. 27, to build from a point of connection with the Pittsburgh, Virginia & Charleston, at or near West Brownsville, Washington County, Pa., to a point near the mouth of Little Whiteley Creek, Greene County, connecting with the located line of the Greene County Railroad, a distance of 22 miles. James Neale, Pittsburgh, Pa., is President.

**POTOMAC & ALLEGHENY.**—This company was chartered in Pennsylvania Oct. 27 to build a steam railroad from a point near Mount Dallas, Bedford County, Pa., to a point on the dividing line between the States of Pennsylvania and Maryland, in Bethel Township, Fulton County, Pa., a distance of 31 miles. Geo. H. Stein, of Philadelphia, Pa., is President. (See also Bedford & Western; also Potomac & Allegheny.)

**POTTS CREEK.**—This company has been incorporated in West Virginia to build a railroad through the Potts Creek Valley from Covington to a point on the Norfolk & Western. J. N. Camden, of Parkersburg, W. Va., may be addressed.

**REDSTONE.**—This company was chartered in Pennsylvania Oct. 20, to build a steam railroad three miles long from the Leonard Lenhart farm in the Township of Redstone, Fayette County, to a point at or near Grindstone, Jefferson County. Albert B. Smith, Locust street, Allegheny, Pa., is President.

**ST. LOUIS & NORTH ARKANSAS.**—An officer writes that at the present time the stretch from Marshall to Leslie, eight miles, is building, and about 250 men are at work. The work is heavy and involves one steel three-span plate girder bridge. This is a portion of the line which is being built to Little Rock, Ark. S. W. Lee, Eureka Springs, Ark., is Chief Engineer. (Sept. 12, p. 716.)

**ST. LOUIS, IRON MOUNTAIN & SOUTHERN (MISSOURI PACIFIC).**—The proposed new issue of bonds which will be voted on at a meeting of the shareholders Dec. 29 will provide for a line from Diaz, Ark., to Carthage, Mo., where connection is made with a branch of the Missouri Pacific, which extends into Kansas City. At Diaz connection is made with the Memphis branch, which runs into Memphis. Thus the new line will afford a through line between Memphis and Kansas City.

**SAN PEDRO, LOS ANGELES & SALT LAKE.**—An officer denies current press reports to the effect that Senator Clark, of Montana, and his associates, will build from a point on the above line to Port St. Louis, Mexico, passing through Jerome, Ariz. (Oct. 24, p. 825.)

**TEHUANTEPEC-SAN NICOLAS.**—A concession has been granted to F. Pearson & Son, Ltd., and to Pedro M. Armandariz, amending concessions previously held by them to permit them to build from Ojapa, on the line of the National Tehuantepec, through Acayucan, San Andres, Tuxtla and Alonso Lazaro to Alvarado; and also a branch line from Alonso Lazaro to some point on the Vera Cruz & Alvarado R. R. Surveys must begin within six months from Oct. 23, and 13 miles must be completed within the first three years, after which an equal amount must be completed annually until the whole line of 100 miles is completed within 10 years.

**TOLEDO, ST. LOUIS & NEW ORLEANS.**—This company which was incorporated last March, is making surveys from Saylor Springs, Ill., to Clay City, Fairfield, McLeansboro and Metropolis, Ill., on the Ohio River. Connection will be made at Saylor Springs with a line located to a point near Trowbridge in Shelby County. H. B. Pierce, of Golconda, Ill.; C. E. Hiltz, of St. Louis, and others are interested. (April 4, p. 258.)

**WATERTOWN & LITCHFIELD TRAMWAY.**—It is said that this company has completed arrangements to build an electric line between Watertown and Litchfield, Conn., 11 miles, and will let the contract in a short time.

**WEST CHESTER STREET.**—This company proposes to build a belt line around Chester County, Pa., which will be about 64 miles long when completed, and will reach Kennett, Oxford, Parkersburg, West Chester and a number of other points. Rights of way are now being secured. The Kennett-Oxford Co., reported in our issue of Sept. 12, p. 715, desires to operate in the same field.

**WEST VIRGINIA ROADS.**—Contract is reported let to Carpenter, Wright & Co. for a new coal railroad in the vicinity of Coal River, W. Va.

## GENERAL RAILROAD NEWS.

**ATCHISON, TOPEKA & SANTA FE.**—See Eastern of New Mexico, under Railroad Construction.

**CALGARY & EDMONTON.**—The Canadian Pacific has notified the above company that it will terminate the existing contract. This contract in connection with the Government subsidy has previously paid the shareholders an annual dividend of 4 per cent. The bondholders' committee has issued a circular urging the holders of securities to deposit them with the committee, with a view to obtaining the most advantageous terms in future negotiations. The reason for this step is not known, but it is thought that the Canadian Pacific desires to control the road. The Calgary & Edmonton line runs from Calgary, N. W. T., to Strathcona, 192 miles.

**CHICAGO, BURLINGTON & QUINCY.**—Offer has been made by this company to purchase the whole or any part, not less than 55 per cent., of the capital stock of the Quincy Railroad Bridge Co., if offered before Jan. 1, 1903. The price paid will be \$200 per share in 3 1/2 per cent. Illinois Division bonds, on which interest of Jan. 1, 1903, as well as subsequent interest, will be paid. The bridge extends across the Mississippi River at Quincy, Ill.

**CHICAGO GREAT WESTERN.**—The Mason City & Fort Dodge, which is the Omaha branch of this company, filed a bill in the Federal Court Nov. 6, asking for an order which would permit it to use the tracks of the Union Pacific between Council Bluffs and South Omaha, including the Omaha River bridge and also the passenger depot in Omaha. The grounds of the request as stated in the petition are that certain other roads entering the city enjoy this same privilege, and the petitioner prays for an equal right with other lines.

**HUDSON VALLEY (ELECTRIC).**—The annual report for the year ending June 30 shows that the company at the present time works 111 miles of road. Gross earnings from operation were \$321,068, and working expenses were \$226,790, leaving net earnings and other income which total \$130,386. After the deduction of \$126,923 fixed charges, the total surplus remaining was \$3,463. The tendency toward high capitalization of electric lines is shown in this instance, the fixed charges being over \$11,043 per mile. A large mileage of the total, however, is on private right of way. Passengers carried during the year amounted to 4,408,761.

**INTERURBAN RAILWAY & TERMINAL (CINCINNATI).**—This company was formed on Nov. 3 as a consolidation of the Cincinnati & Eastern Electric, Suburban Traction and Rapid R. R. companies. It is understood that the company will absorb the Interurban Terminal Co., recently organized, which is building a terminal station in Sycamore street, Cincinnati. The Cincinnati & Eastern, which runs as far as New Richmond, 28 miles, has just been completed, and the other component lines are about half completed. The total mileage worked will approximate 65.

**MEXICO ROADS (ELECTRIC).**—Press reports state that Sperry, Jones & Co., bankers, of Baltimore, Md., have taken control of the Stuydon Street R. R. lines in the City of Monterey, Mexico. They have also a concession to build additional electric lines and will shortly organize a company under New Jersey laws.

**OREGON SHORT LINE.**—Shareholders on Oct. 9 voted to amend the articles of incorporation to give the company the right to build or purchase ferry steamship warehouses, etc., and to acquire the capital stock and obligations of companies so engaged. The amendment also provides for power to build or acquire connecting railroads, terminals, etc.

**WABASH.**—Notice is given that this company will exchange its 1889 first mortgage 5's, due in 1939, for St. Charles bridge first mortgage bonds due in 1908, at a valuation of 109.85 and accrued interest. St. Charles bridge second mortgage bonds will be taken at a valuation of 102.78. Brunswick & Chillicothe first mortgage bonds Aug. 1, 1903, will be taken at 103.13, plus accrued interest. St. Louis, Council Bluffs & Omaha first mortgage bonds due in 1908 will be taken at 109.49. The Wabash first mortgage bonds given in exchange will be issued at a valuation of 116.42 and accrued interest. The Wabash reserves all rights to pay off or exchange St. Charles Bridge Company first and second mortgage bonds at maturity, or to surrender the bridge and mortgage property to the trustees to be sold for the benefit of bondholders.